CORAL Name: RTA-1300C-ASOne150-5Gas

Location: 2L, room 12-1110A
Purpose: Rapid Thermal Processing
Contact: Eric Lim, Dennis Ward

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Introduction

The RTA-1300C-ASOne-5Gas uses quartz lamps to rapidly heat samples in a variety of ambient atmospheres. Gases available are Argon (Ar), Nitrogen (N_2), Oxygen (O_2), Ammonia (NH_3) and forming gas (95% N_2 / 5% Hydrogen (H_2)). 100mm wafers and pieces can be run in a SiC coated graphite susceptor or on a Si handle wafer. 150mm Si wafers can be run by removing the susceptor and placing the wafer directly on the quartz pins. Temperature is measured using a high temperature pyrometer with different calibration and PID tables for running with the susceptor or a Si handle wafer. The high temperature pyrometer will not read below 100°C on the susceptor or below 350°C on a Si handle wafer. The thermal environment using the susceptor is more uniform, but the ramp rate is limited to 20°C/sec. Recipes that require a faster ramp rate (up to 150°C/sec) or that use O_2 need to use a Si carrier wafer instead of the SiC coated graphite susceptor.

HSQ is allowed, but other photoresists are not allowed in the system and organics in general are prohibited.



Safety

Hazards present on the system are high temperature parts, possible pinch/crush points, high voltage and pressurized gases. Parts and samples can be at high temperatures during and after processing, exercise care when removing samples or parts from the chamber.

Mechanical pinch/crush points exist with the chamber lid. Two struts normally hold the chamber open for loading/unloading samples. Please use two hands when opening and closing the chamber and keep fingers and other body parts clear when closing the chamber.

Ar, forming gas and N_2 displace oxygen and can cause rapid suffocation. O_2 is a strong oxidizer and can cause or intensify a fire. NH_3 is a toxic and flammable gas and can form explosive mixtures with air. Under normal operation the user is protected from these hazards by the system software, tool panels and interlocks, and the Toxic Gas Monitoring System (TGMS). Do not attempt to open or remove any panels as you risk exposing yourself (and others) to these hazards.

If the tool is behaving dangerously or making loud noises, press the red EMO button, alert the staff, and shutdown the system on Coral. DO NOT attempt to re-energize the tool!

User Qualifications and Responsibilities

During training you will learn to load samples and run recipes. To be considered qualified you need to be trained by the staff in charge, be up-to-date with your safety trainings and have a PTC approved process.

HSQ is allowed, but other photoresists are not allowed in the system and organics in general are prohibited. Circumventing these restrictions or running processes/materials that have not been approved by the PTC can lead to disqualification from the tool.

Any metal contact will cause the SiC coating on the susceptor parts to degrade and fail, so it is important to use the provided PEEK soft-tip tweezers when handling the susceptor, susceptor lid, or when loading/unloading samples from the susceptor. Metal tweezers will damage the SiC coating on the susceptor.

Users are expected to leave the susceptor and lid in the chamber, to close and lock the chamber and log out of their account when they have finished using the tool.

If you encounter any problems or notice anything unusual while operating the machine, report the issue in CORAL so that the staff can address it in a timely fashion.

Operating Procedures

Make CORAL reservations ahead of time for the RTA-1300C-ASOne150-5Gas. Verify that the system is not being used before you engage on CORAL. The software checks CORAL status, so you need to engage before you can run any recipes.

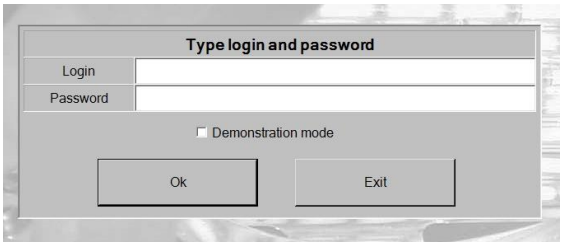
Starting software and logging in

1. If it is not already open, start the AnnealSoft control program by double-clicking the icon on the desktop.



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2. Log in to the software using the credentials provided for your research group.

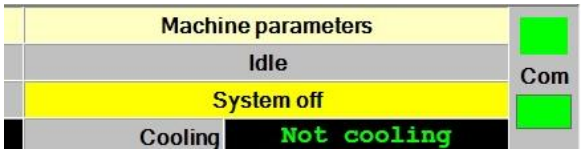


3. You should be on the process screen, if not, click on **Process** in the navigation area:



Loading samples

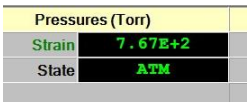
4. If the software indicates the machine is off:



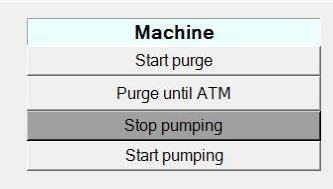
5. Turn it on by pressing the green button on the front panel



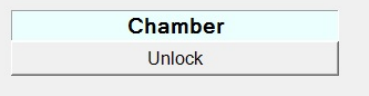
6. If the chamber is not at atmospheric pressure



7. Click on **Purge until ATM** to vent the chamber.



8. Click **Unlock** in the Chamber section of the screen then use two hands on the front bar to lift open the chamber lid.



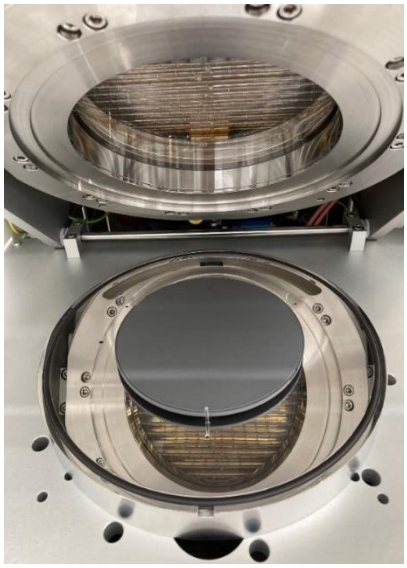


Figure 1 chamber open

9. Use the PEEK tweezers (not metal tipped!) to remove the lid from the susceptor and place it on the quartz plate.

NOTE: Any metal contact will cause the SiC coating on the susceptor parts to degrade and fail, so it is important to use the provided PEEK tweezers when loading and unloading samples.

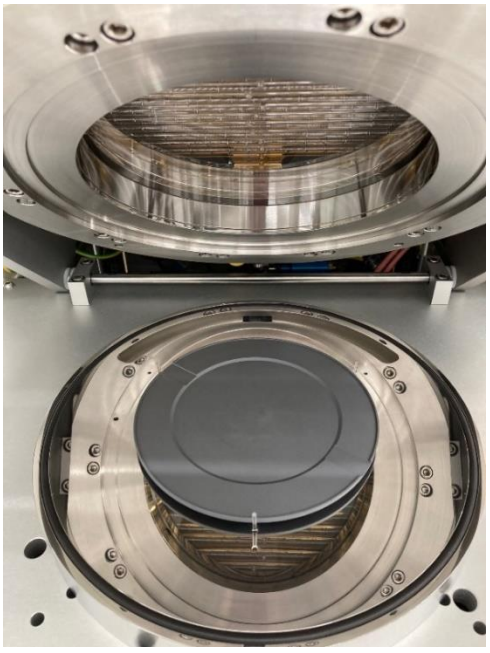
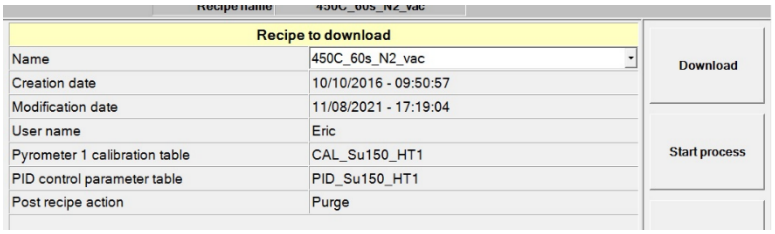


Figure 2 Susceptor with lid off

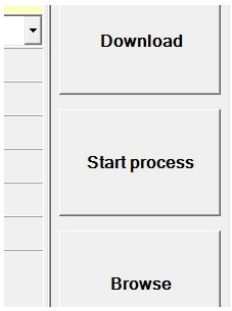
10. Place your samples in the susceptor recess and replace the lid.
11. Using two hands, slowly lower the chamber lid, engage the handle, then click **Lock** on the chamber section of the screen.

Downloading and running a recipe

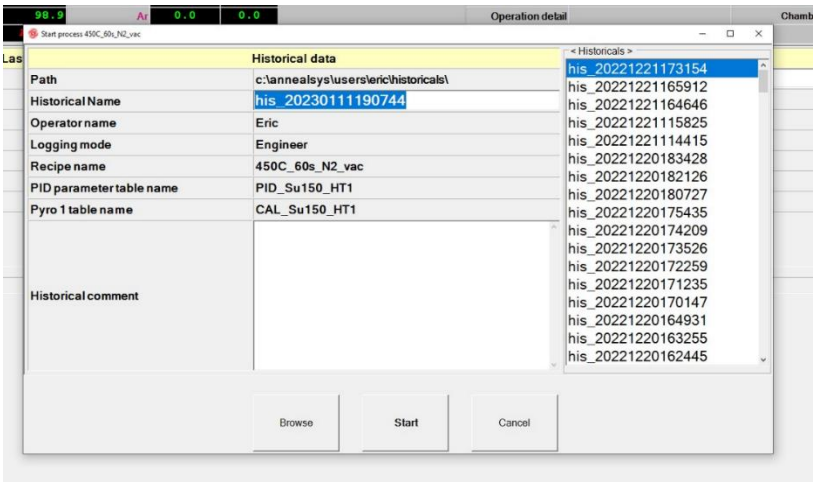
12. Select the recipe you want to run from the drop-down menu then click **Download**.



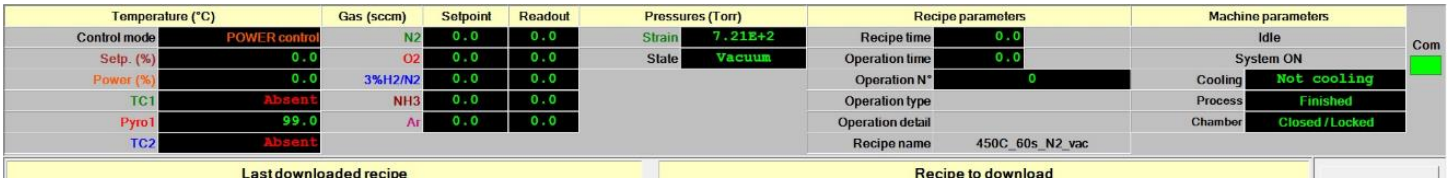
13. Check to be sure the Pyrometer calibration table and PID table are appropriate for the carrier you are using. Generally “Su” for the susceptor, “Si” for a silicon carrier. If it doesn’t match, contact the specialist in charge to edit the recipe to the correct tables.
14. If everything matches click on **Start process**



15. You should get a pop-up window that will ask you for a filename for the data file. Default is “his_” followed by a date/timestamp. You can modify the filename if you wish. Click on **Start** to start the recipe.



16. Once the recipe is running the current values for process parameters will be updated in the system status area and the lower portion of the screen will show a plot of the process parameters.



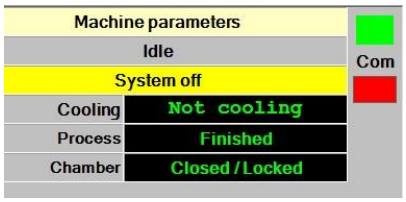
17. Once the recipe has finished, a window will pop up saying the recipe has finished successfully. Click **OK** to dismiss the window. If the pop up window has an error message instead, please report a problem in CORAL and include the error message.
18. Unlock and open the chamber, remove your samples using the appropriate tweezers and repeat the preceding steps to run your next sample.

Finishing up and logging out

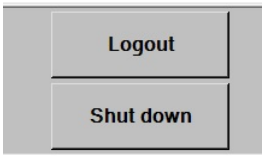
19. Once you are finished running all of your samples, replace the susceptor lid, then close and lock the chamber lid.
20. Turn off the machine by pressing the red button on the front panel of the tool



21. The Alarm light will go red, you can reset the alarm by clicking on the red box in the machine status area, it will turn green once the alarm is reset.



22. Use the **Logout** button to log out of your account.



23. Disengage the RTP-1300C-ASOne150-5Gas on CORAL.

Appendices

Notes

The system is set up by default to run with a SiC coated graphite susceptor. The thermal environment using the susceptor is more uniform, but the ramp rate is limited to 20°C/sec. Due to the thermal mass of the susceptor, recipes for temperatures <500°C will tend to overshoot unless you use an even slower ramp rate or insert a coast step. If you require a ramp rate greater than 20°C/sec or want to flow O2 you will need to use a Si carrier wafer instead of the SiC coated graphite susceptor.

100mm wafers and pieces can be run using the susceptor or on a Si handle wafer. 150mm Si wafers can be run by removing the susceptor and placing the wafer directly on the quartz pins.

Temperature is measured using a high temperature pyrometer with different calibration and PID tables for running with the susceptor or a Si handle wafer. The high temperature pyrometer will not read below 100°C on the susceptor or below 350°C on a Si handle wafer.

If you are running with a Si wafer instead of the susceptor you must make sure the recipe is using the Silicon pyrometer calibration and PID tables.

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Troubleshooting

Difficulty engaging lid handle

If you have trouble engaging the handle when closing the lid, open the chamber and check if the chamber o-ring has pulled out of the groove. Press the o-ring back into the groove if necessary, and try again.