

## Brewer Spinner and Hotplate

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**Location:** Lithography Inspection Area

**Primary Trainer:** Scott Munro (587-879-1517, [smunro@ualberta.ca](mailto:smunro@ualberta.ca))

**Secondary Trainer:** Stephanie Bozic (587-879-1515, [sbozic@ualberta.ca](mailto:sbozic@ualberta.ca))

### OVERVIEW

The Brewer spinner and hotplate are used for some EBL resist spinning applications. It is currently restricted to the following: PMMA, ZEP, HSQ and NXR-1025, and AquaSave. Contact nanoFab staff if you are interested in using different materials on the Brewer.

The spinner has individual chucks for different sized substrates and a Teflon liner for easy cleaning. Spin programs of up to 100 steps can be entered specifying velocity (RPM), ramp (RPM/sec) and time (sec). The hotplate is programmable (up to 1000 steps) with a range from ambient to 400°C. It has three bake methods: contact, vacuum and proximity.

### SAFETY PRECAUTIONS

Most spin on resists contain organic solvents, which may have associated hazards. Refer to the appropriate MSDS. The spinner and hotplate both vented to minimize exposure to solvent vapour.

Ensure the lid is closed during both the spin and bake process. Note that the lid must be closed during the spin cycle in order to function properly.

The hotplate will be hot regardless of whether or not it is in use. Use caution when loading and unloading samples, and use only metal tweezers for sample handling. The plastic blue tweezers or other plastic tweezers are not allowed.

***If you are bringing any new materials into the NanoFab for use in your process, it is necessary to fill out a chemical import form (available on our website, <http://www.nanofab.ualberta.ca>) and supply an MSDS data sheet to Stephanie Bozic.***

### **PROCESS COMPONENTS OR FEATURES**

Users should have a process flow appropriate for their process, with spin and bake conditions, before using the system. If processing for EBL work, an understanding of the variety of resists and the required thickness for patterning is beneficial. Prior to spinning, the samples should be very clean, a piranha clean just prior to spinning is recommended.

If processing a new resist, or developing a new process and the thickness of the resist needs to be measured, it is recommended to perform the testing process on bare Si samples. Using bare Si will enable the user to use the Filmetrics optical measurement tool quickly and easily. Multiple layers (ie. SOI, SiO<sub>2</sub>/Si) may complicate the measurement.

### **OPERATING INSTRUCTIONS**

1. Samples should be clean and ready for coating. If the resist you are using has been stored in the fridge, it should be left at room temperature to warm and stabilize. Do not open a cold bottle.
2. Ensure both the spinner and hotplate computers are on by touching the screen. They should be left on, but if they are shutdown, turn on the power switch on the face of the system. The hotplate has a standby schedule, and is set to 90C during staffed hours, 25C after hours.
3. **Hotplate Setup** - The hotplate should be set to the desired bake temperature and allowed time to heat and stabilize. To set the temperature, press the **Config** button, and then press **Thermal Configuration**. Select the temperature box and edit the value to the desired temperature. Press **Save** to apply any changes. Once saved, the system will begin to heat to the set temperature.
4. To view the current temperature setting, press the **Diag** button, and then press **Thermal Diagnostics**. In addition to viewing the temperature users can also control the vacuum and lift pins. For smaller pieces, the vacuum and lift pins are not necessary, but for larger samples (full size wafers), or for certain processes, it may be necessary to change the

vacuum control or use the lift pins. Note that changing the temperature in this window will not affect the actual temperature, only changes made in the Thermal Configuration window will actually change the set point. Wait until the hotplate has stabilized at the desired temperature before beginning the spin process.

There are two ways to use the hotplate, either by remaining in the Thermal Diagnostics window and manually controlling the hardware and timing the bake time, or by running a recipe, in which several steps may be incorporated into the bake process.

To create or edit a recipe, press the **Edit** button. Press **Load**, and select a desired recipe. Edit and save are required; if saving a new recipe, enter a unique name.

Once the recipe is setup, press the **Run** button to view the process window. Press **Load**, and again select the desired recipe.

5. **Spinner Setup** – Begin by installing the appropriate sized chuck for your process. There is a small chuck for processing 1cm x 1cm samples, a 2” diameter chuck, and a 4” diameter chuck. The 1cm chuck uses an o-ring around the outside to properly secure the sample, while the larger chucks contain vacuum grooves. Align the notch on the chuck with the alignment mark on the spindle.

Regardless of chuck size, the sample must cover the entire surface of the chuck. The reason is two-fold. One is to ensure the sample is securely held by the vacuum during the process, preventing the sample from flying off the chuck at high speed, and the second is to keep the chuck from becoming contaminated and the vacuum lines clear of resist that gets sucked into the lines during a process. Hardened resist deep inside the system is difficult to access and clean, and results in tool down time.

6. To create or edit a recipe, press the **Edit** button on the software. Press **Load** to view the list of current recipes. If using a previously created recipe, scroll to find the desired recipe. If creating a new recipe, begin by selecting a recipe similar to yours. There are a variety of parameters that may be adjusted, edit as required and press **Save**. If creating a new recipe, enter a unique name.
7. Once the desired recipe has been edited, select the **Run** button. Press **Load**, and select the desired recipe.
8. Place the sample on the chuck, centering as best as possible. Press **Hold** to apply the vacuum, **Release** to release the vacuum. Note that the Centering and Start Process buttons will not be active if there is a poor vacuum.

9. Verify the sample is centered by pressing the **Start Centering** button. The chuck will spin at 20rpm for 10s. If further centering is required, wait until the rotation stops, press **Release**, and adjust the sample. Repeat the centering process until the sample is properly centered.
10. Once centered, dispense the desired amount of resist onto the sample. Quickly close the lid and press **Start Process**. Note the run will not begin with the lid open. The process will run for the time entered in the recipe. To stop the run at any time, press the **Abort** button.

The sample may fall off the chuck during the course of the run. If this happens, the process will stop automatically. Open the lid and remove the sample. It may be beneficial to perform a dummy run with no resist to verify the sample will remain on the chuck at high speeds.

11. Once the spin process has finished, open the lid and carefully remove the sample from the chuck, and transfer it to the hotplate. Ideally the sample is held by the sides or the bottom, never the top surface. Ensure plastic tweezers/holders do not contact the chuck.
12. For controlling the hotplate in manual mode, ensure you're in the **Thermal Diagnostics** window. Adjust the lift pins and vacuum control as required, and start a manual timer.

The control using a recipe, you should be in the **Run** window, and the desired recipe loaded. Press **Start Process** to begin the process. The process will run for the set time. Press **Abort** to stop the process if required.

13. Once the desired time has been reached, carefully remove the sample and set aside to cool. Again, never touch plastic tweezers to the chuck.
14. If more samples are being processed, repeat the above process. Once all samples are done, remove the chuck and liner from the spin coater and bring them to a wetdeck. Wipe the chuck and liner with acetone and IPA until clean. Place them back into the spinner.
15. Reset the hotplate to 90C by returning to the **Thermal Configuration** window, entering **90C**, and again pressing **Save**. Leave both the spinner and hotplate programs on.

## **TROUBLESHOOTING**

Poor vacuum and/or samples failing to remain on the chuck during a spin cycle indicate vacuum issues. Ensure the backside of the sample is clean and covering all areas of the chuck. Inspect the chuck grooves and vacuum port at the Centre for cleanliness, and clean as required.

***If you encounter an unexpected error or require assistance please contact the primary or secondary trainer listed above. Should they not be available, please contact any staff member for assistance.***

## **APPROVAL**

**Qualified Trainer:** Scott Munro  
**Training Coordinator:** Stephanie Boric