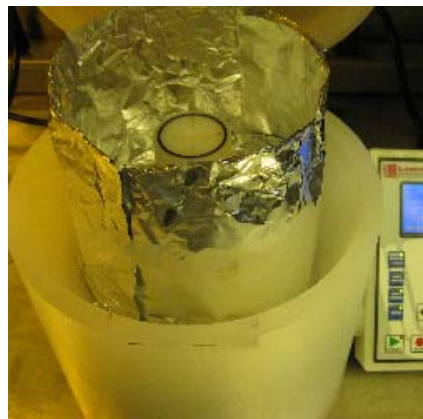
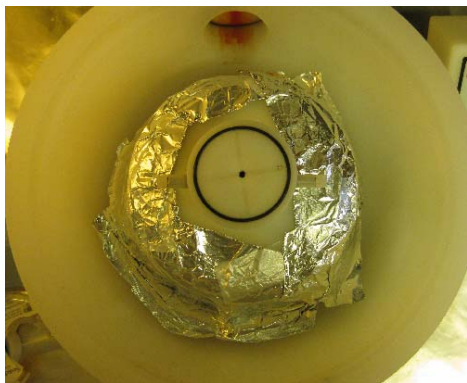


Part I. How to Program the 650 Controller

- Please do not use program 1, 2, and 3 for your experiment.
 - Use Programs 4-20 instead.
1. Turn on the spin processor by pressing the black button on the lower right backside of the processor. The controller will initialize and enter the 'Select Sequence' mode by default.
 2. To choose an existing program, highlight the desired program. To create a new program, highlight the empty line.
 3. Press the 'Edit Mode' key. If this is a new program, a program name will be assigned. The program name will appear on the title line.
 4. Use the navigation keys (←→↑↓) to move from line to line, or the 'Tab<' or 'Tab>' key to move from field to field. The 'Tab' keys enable the field to be editable. Make changes to the field by using the ↑ and ↓ arrow keys.
 5. For example, add or delete steps by highlighting the 'steps' field with the 'tab' key, and increase or decrease the number using the ↑ or ↓ arrow keys.
 6. Set the value for 'Rpm' and 'Acel' digit by digit. Switch between the digits using the ← or → arrow keys.
 7. Move from one step to another using the 'FWD' or 'REV' Key.
 8. The valve and sensor parameters are not applicable to this spin processor
 9. When finishing programming, press the 'Run Mode' key.

Part II. How to Run the Edited Program

- For details, refer to Part V. 'Proper Operation of the Spin Coater'.
1. Select the program to be run using the 'Select Process' key. Press the 'Run Mode' key. The program name will appear on the title line.
 2. Open the lid, line the inside of the spin processor bowl with a cylinder made of aluminum foil. You can use the plastic cylinder on the bench as template. The upper rim of the cylinder should be an inch taller than the substrate level. You will also need to cover the stationary seal (see attached figure) of the processor bowl with some aluminum foil. Tape the aluminum together so that they do not fly loosely. In this case, also make sure that the Al foil does not touch the rotating seal (See attached figure).



3. Remove the cylindrical Aluminum foil liner for now.
4. Place and align a substrate on the vacuum chuck. You can attach an appropriate fragment adapter to hold the substrate. If so, make sure the adapter fits tightly. Use acetone to wipe clean the o-ring and the substrate holder if dirty. Make sure the **SUBSTRATE IS LARGE ENOUGH** to cover the O-ring **COMPLETELY**. When the micro slide adapter is used, make sure the slides fit in the groove snugly. Use the alignment tool to facilitate wafer centering.
5. You **MUST NOW PRESS THE 'VACUUM' KEY** to activate the vacuum valve. Check and make sure the vacuum value is around 25. Sufficient vacuum to hold the substrate is required to start the motor, and to prevent leakage of chemicals into the vacuum path.



6. Dispense appropriate amount of photoresist (or other chemicals) onto the substrate.
7. Put the cylindrical aluminum liner back into the bowl.
8. Close the lid.
9. Press the 'Start' key to start the program. Error message will be displayed when any of the following criteria is not met.
 - Low vacuum.
 - Low compressed air pressure.
 - Lid is open.
10. A message 'Done' will be displayed on the screen when the process is completed.
11. Open the lid.
12. Press the 'Vacuum' button again to turn off the vacuum, and then remove your sample. Take out the cylindrical liner and put it on a separate sheet of Al foil on the bench top if it gets in your way.
13. Thoroughly clean up the spin coater following the guideline below.
14. Switch off the power.

Part III. How to Thoroughly Clean the Spin Coater after Your Use

1. Remove the fragment adapter and dispose of the cylindrical liner.
2. Cover the chuck with a blank wafer with VACUUM ON in order to prevent chemicals from entering the vacuum path.
3. Rinse and wipe dry any remaining contamination inside the processor bowl and on the lid with acetone. Note: DO NOT flood the process chamber during cleaning.
4. Wipe clean the chuck surface and fragment adapter with acetone wipes.
5. Remove the O-ring from the fragment adapter, and properly store both the fragment adapter and the O-ring in the drawer below the bench.
6. Empty liquid in the drain collector (on the back of the processor) into the organic waste bottle. Wipe clean the drain collector and screw it back on. Label any new photoresist used on the waste label.
7. Clean the outside of the spin processor.
8. Wipe clean the key pad if dirty, DO NOT spray or flush the key pad.



Please DO NOT flood this area



Please DO NOT force any liquid or compressed air into the vacuum path

Part IV. Features of the Laurell WS-650 Spin Processor

- Digital process controller: 100-8000 rpm, with 0.5 rpm resolution,
- Hold up to 6 inch wafer or 4 inch square substrate,
- The 650 controller holds up to twenty 51-step programs,
- 1.75 inch natural propylene vacuum chuck holds 50mm through 150 mm substrates
- Fragment adapters:
 - Microscope slide adapter: 1"×3" microslides
 - Fragment adapter for holding 10mm through 50mm pieces
 - Wafer alignment tool
 - With EPDM O-rings for common solvent systems, and Viton O-rings for acids, CH_2Cl_2 , Chloroform, THF, and toluene systems. (Please let us know when acid or toluene needs to be used.)

Part V. Proper Operation of the Spin Coater.

In order to prevent liquid from entering the vacuum path, it is crucial to keep a tight vacuum seal between the substrate and the chuck whenever liquid is applied.

1. Choose the right chuck adapter and O-ring according to your substrate size.
 - The substrate should always be large enough to cover the O-ring completely.
 - The 1.75 inch chuck on the spin coater is for 50 mm-150 mm substrates.
 - Use the small fragment adapter for 11-50 mm substrates. There are two grooves on the adapter. The inner O-ring is for fragments greater than 11mm * 11mm, the outer O-ring for fragments greater than 20mm*20mm. Use only one O-ring of appropriate size each time.
 - Use either the small fragment adapter or the 3*1 microslide adapter for 3*1 microslides. We recommend you use the small fragment adapter since it provides better vacuum seal.
2. Choose the right O-ring type based on the solvent in the liquid to be dispensed.
 - Use the EPDM O-ring for general solvents, such as acetone, isopropanol, and photoresists.
 - Use the viton O-rings for acids and organic solvents that swell the EPDM, such as toluene, THF, chloroform, etc.
 - We require that all O-rings be removed from the adapters and stored in their original package after work is done, especially the viton O-rings. In case viton O-ring (brown colored) is used on the 1.75 inch chuck, change back to the EPDM (black colored) O-ring when your work is done.
 - The proper way to install O-ring is explained in details in one flier on the hood.
 - A pair of tweezers for changing O-rings is provided in the drawer under the spin coater.
3. Before you dispense the liquid,
 - Check the O-ring condition. Make sure the O-rings are intact, clean, and fully seated in the O-ring grooves.
 - Make sure that the vacuum is turned on. The screen should show a vacuum reading of 25 mm Hg.
 - **Check the vacuum again right before you apply any liquid to the substrate surface.** The spin coater will automatically enter the sleep mode in which vacuum is turned off if the keypad is inactive for a few minutes even though you might have pressed the 'vacuum on' button some time during programming.
4. You are ready to dispense the liquid,
 - Apply as little liquid as possible onto the substrate surface.
 - Use only the amount that can completely cover the entire surface. Excess liquid will overflow the other side of the substrate, which then easily get to the vacuum path if the vacuum seal is not tight enough. Besides, it is a waste of resource!
5. When you are done with spinning,
 - After removal of one spin sample, check the chuck and the O-rings. Clean the O-rings if dirty. If leakage from the O-ring seal is suspected, the O-ring needs to be removed, cleaned, reinstalled, or replaced if necessary. Then spin the next sample.
 - When you are done with your work, clean up all contamination thoroughly using wipes with appropriate solvents. Do not forget the inside of the lid, the wafer chuck, and the rotating seal.