

Laurell WS-400B-6NPP-Lite Manual Spinner

Standard Operating Procedure

Faculty Supervisor: Prof. Robert White, Mechanical Engineering (x72210)

Safety Office: Peter Nowak x73246 (Just dial this directly on any campus phone.)

(617)627-3246 (From off-campus or from a cell phone)

Tufts Emergency Medical Services are at x66911.

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Warnings:

Your wafer should not be wet or have sticky chemicals of any kind on the back side. If it is, water and chemicals can get pulled into the vacuum line. This will eventually destroy the tool and may cause problems for the vacuum system as a whole.

Similarly, you must never spray solvents onto the chuck while it is on the tool; the solvents will be pulled into the vacuum line. This will eventually destroy the tool and may cause problems for the vacuum system as a whole. For this reason, when cleaning the bowl, a dummy wafer should always be clamped onto the chuck.

It is a good idea (although not required) to dehydrate your wafer prior to spinning on resist. 30 minutes in a 120 °C oven should do it.

1.0 Material Requirements:

1.1 Equipment: substrate, photoresist, adhesion promoter (if needed) wafer tweezers, pipettes

1.2 Personal Protective Equipment: nitrile gloves, trionic gloves, safety glasses

2.0 Procedure:

Prep work hours or the day before:

1. If your resist is in the fridge, take it out and let it warm up for an hour before you open it; you don't want any water condensing into it.
2. If you are working with SU-8 (or another very viscous resist), you do not need to follow this step. You can pour directly from the SU-8 stock bottle. However, if you are working with a less viscous resist, get a small bottle for your resist, rinse it with acetone and IPA and blow it dry with the nitrogen gun. Pour resist from the stock bottle into the small bottle to work with. Label the small bottle with the type of resist, date poured, and your name. Do the same thing for the adhesion promoter. Keep them for your next use. It would be a good idea to do this a few hours ahead of time to allow bubbles to settle out of the resist before you use it!! For very viscous resists, you should pour your resist the day before. Store the poured resist bottles in the photoresist cabinet. Put your stock bottles back in the fridge or photoresist cabinet.

Startup:

3. Open the valve on the compressed nitrogen cylinder next the OAI Model204IR aligner. The regulator should read 60 psi at the outlet. This is supplying purge air to the spinner through a long ¼" tube.
4. Turn on the house vacuum on the wall to the left of the hood. Open the faucet-style valve all the way.
5. Plug in the spinner at the front of the hood on the left. The "Vacuum" warning should be flashing. The "CDA" warning should **not** be flashing. If it is flashing, the spinner is not receiving sufficient compressed air for some reason. Check that the nitrogen cylinder valve is open, the regulator reads 60 psi, and that there is not problem with the ¼" tube.
6. Make sure the waste cup is connected at the back of the spinner to catch any waste.
7. If you are using a hotplate for softbake, put it in the hood before you start and get it set to the right temperature.
8. If you are using an oven for softbake, turn it on and make sure it is set to the right temperature.

9. If you are using SU-8, line the inside of the spinner lid with tinfoil. Line the spinner bowl with cleanroom wipes. Your goal is to stop SU-8 from getting on the bowl or lid as much as possible.

Programming:

1. Select which program you want to work on. Push “program select” to cycle through program A through T. Please do not edit program T, this is the cleaning program. In program A, please only edit the “spin speed”, leave everything else the same. You are free to edit programs B-S as desired.
2. Push “F1” to edit the current program. Edit, add, and delete steps, and edit the step time (in seconds), final spin speed (in rpm) as desired. The “acceleration index”, labeled “ACL” should be set to the default, 015, for all steps. The tool will compute the acceleration rate in rpm/second and display it next to the ACL setting.

A “normal” program might have 5 steps. This would be a 4 second, 500 rpm “spread” followed by a 30 second 3000 rpm “spin”. Program “A” should be set up like this, only the 3000 rpm number in Step 3 and Step 4 should be changed.

<i>Step 1: Time 2 sec, Speed 500 rpm, ACL 015</i>	Ramps up to 500 rpm in 2 secs.
<i>Step 2: Time 4 sec, Speed 500 rpm, ACL 015</i>	Holds at 500 rpm for 4 secs.
<i>Step 3: Time 2 sec, Speed 3000 rpm, ACL 015</i>	Ramps up to 3000 rpm in 2 secs.
<i>Step 4: Time 30 sec, Speed 3000 rpm, ACL 015</i>	Holds at 3000 rpm for 30 secs
<i>Step 5: Time 2 sec, Speed 0 rpm, ACL 015</i>	Decelerate to 0 rpm in 2 secs.

3. Once you’ve got your program all set, push F1 to go back to operating mode.

Important: If you are using SU-8, polyimide, or some other resist which does not readily dissolve in acetone, then you must line the bowl with cleanroom wipes. You must also very carefully clean up after yourself. Let’s try to keep this spinner alive and useful for a long time.

Load a wafer:

1. Set the pins on the wafer alignment tool to your substrate size. Put your wafer on the tool hard up against the stops.
2. Open the lid.
3. Use the tool to center the wafer on the chuck. Push “vacuum” to turn on the vacuum. The wafer should be stuck on the chuck (check it!). The “Vacuum” warning should stop flashing on the front panel.

Static Dispense:

Note: It is strongly recommended that before you trust your program, you put a dummy wafer on the tool and run your program without any chemicals to make sure it works as desired!!!!

1. Load HMDS adhesion promoter into a puddle on top of the wafer using a pipette. Do not load it so full it flows over the edge.
2. Close the lid.
3. Run the program. The HMDS will spin off.
4. Open the lid.
5. Load photoresist onto the top of the wafer using a pipette. Do not load it so full it flows over the edge. Do not allow any bubbles in the resist. If you get any, try to suck them up with the pipette.
6. Close the lid.
7. Run the program.

Removing the wafer and softbake:

1. If you are working with SU-8, remove the wafer with your SU-8 tweezers. For any other resist, you may remove the wafer with the alignment tool.
2. Put the wafer on a hotplate or into the oven to softbake. (You must determine softbake times and temperatures from your manufacturer datasheets. Temperature should be on the order of 100 °C. Time will be on the order of 1 to 30 minutes.)
3. If you are using a hotplate, it should already be set up in the hood. (See startup section)

Clean Up:

Note: If you used SU-8, polyimide, or some other resist which does not dissolved in acetone, you should have lined the bowl with cleanroom wipes before spin processing. Remove these and dispose of them in the photoresist/solvent trash. Wipe any remaining residue out of the bowl with cleanroom wipes before proceeding with the rest of the clean:

1. After you are done with all your wafers, load a dummy wafer onto the chuck and turn on the vacuum.
2. Spray acetone onto the wafer from a squirt bottle.
3. Run the “clean” program (Program T) and keep spraying acetone onto the wafer through the hole in the lid while the program runs. This should spray acetone all over the inside and clean out the resist residue.

Clean Program:

Step 1: Time 10 sec, Speed 1000 rpm, ACL 015

Step 2: Time 10 sec, Speed 3000 rpm, ACL 015

Step 3: Time 10 sec, Speed 5000 rpm, ACL 015

4. If any resist remains, do it again.
5. After it is all cleaned, do the same thing with isopropanol.
6. Wait for any solvent to drain into the waste reservoir, then remove it and dump it into the solvent waste bottle in the hood. Rinse out the waste cup with acetone and isopropanol in the hood.

Shutting Down:

1. Unplug the spinner.
2. Turn off the hotplate, if you used one, and when it is cool unplug it and remove it from the hood.
3. Turn off the oven, if you used one.
4. Close the valve on the N₂ tank near the aligner. The outlet pressure should start to drop.
5. Close the faucet-style vacuum valve on the wall to the left of the hood.

If at any time you feel a situation is dangerous, do not hesitate to call the safety office (x73246, Peter Nowak) the faculty supervisor/lab manager (x72210, Robert White), or Tufts Emergency Services (Police/Fire/Ambulance at x66911).

Report all accidents (injuries, major spills, fires) to the safety office at x73246 (Peter Nowak) and Prof. White at x72210. For emergencies, call Tufts Emergency Services at x66911.