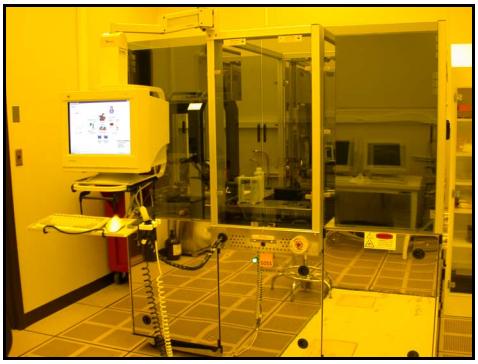
Date Created: May 3, 2004
Date Modified:

ACS 200

Equipment Standard Operating Procedure

Greg Allion and Kimberly Appel



1. **Purpose**
   1.1. The ACS 200 is used for automated resist coating and development of 4-inch substrates.

2. **Reference Documents**
   2.1. Karl Suss ACS 200 manual

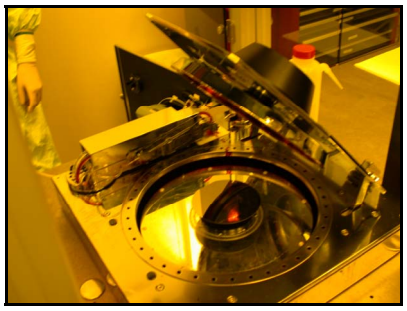
3. **Equipment**
   3.1. Tweezers
   3.2. Vacuum wand

4. **Materials**
   4.1. AZ 9260 Photo Resist
   4.2. HMDS Adhesion Promoter
   4.3. MF 319 Developer
   4.4. NANO EBR
   4.5. Nitrogen
   4.6. Shipley 1813 Photo Resist
   4.7. Shipley 1827 Photo Resist

5. **Protective Equipment**
   5.1. Eye Protection: safety glasses must be worn at all times.
   5.2. Hand Protection: vinyl or latex gloves.

6. **Engineering and/or Administrative Controls**
   6.1. The ACS 200 is located in the Sub micron Room.
   6.2. The tool owner is Tim Brock. The check off person is Greg Allion, gallion@eecs.umich.edu.
   6.3. Only authorized user may operate this piece of equipment.
   6.4. This tool must be reserved in advance for use. Sign up sheets are located on the SSEL Scheduler.
      6.4.1. If you sign up for a time slot and cannot make it, then be considerate and remove your name from the sheet.

7. **Procedure**
   7.1. Do not open any doors during processing. This will generate an error.
   7.2. You must always use the scheduler to reserve an opening on this tool.
   7.3. Overview
      7.3.1. Material Handling Unit (MHU): this unit transfers the substrate to the various modules on the system.
      7.3.2. Centering Station: centers the substrate on the robots end effecter by contact.
      7.3.3. Spin Coater: is comprised of a bell shaped cover placed over the chuck and substrate during the spin cycle. The cover closes creating a solvent saturated atmosphere.



         7.3.3.1. The photo resist is spread evenly over the entire surface by having all parts rotate synchronously as does the confined air inside the cover thus eliminating turbulence (no vortex).
         7.3.3.2. A solvent saturated atmosphere helps to eliminate usual spinning defects, i.e. rebounding, splash back, comets and striation.
         7.3.3.3. The standard chuck can accommodate substrates from 3 inch to 8 inch in diameter or 4 inch to 6-inch squares.
         7.3.3.4. Photo resist coating takes place on the left hand side of the system.
         7.3.3.5. Spin coating specifications
            7.3.3.5.1. Maximum acceleration: 5000rpm/sec
            7.3.3.5.2. Minimum acceleration step: 100 rpm/sec
            7.3.3.5.3. Maximum substrate thickness: 3mm
            7.3.3.5.4. Maximum speed: 7000rpm
            7.3.3.5.5. Minimum step: 10rpm

7.3.4. Developer Module: the robot handler places the substrate in the developer process chamber. There the substrate is covered with developer while spinning. Spraying the substrate with DI water completes developing.

7.3.4.1. The chuck spins slowly during development and then accelerates at the end for drying with the help of a nitrogen blow.

7.3.4.2. Developing takes place on the right hand side of the system.

7.3.4.3. Developer specifications

7.3.4.3.1. Maximum chuck speed: 6000rpm

7.3.4.3.2. Developer flow rate: 600ml/min

7.3.4.3.3. DI water flow rate: 1800ml/min

7.3.5. Hot/Cold/Vapor Prime

7.3.5.1. All three modules are located on the right hand side of the system.

7.3.5.2. The hot plate is used for baking substrates.

7.3.5.2.1. Temperature range is 50˚C to 350˚C ±0.5°C

7.3.5.3. The cold plate is used for temperature conditioning of substrates.

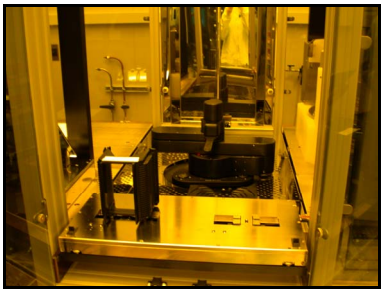
7.3.5.3.1. Temperature range is 15°C to 30°C ± 0.5°C.

7.3.5.4. Vapor Prime is used to vacuum bake substrates at 90˚C.

7.3.5.4.1. Its primary focus is to remove absorbed moisture from the substrate and deliver a uniform and controlled coating of an adhesion promoter (HMDS) to its surface.

7.3.5.4.1.1. Temperature range is 50˚C to 250˚C.

7.3.6. Wafer Cassette



7.3.6.1. There are two (2) cassettes that can be used on the ACS 200. Both cassettes are labeled for this system.

7.3.6.1.1. Do not use the cassettes for any other operations.

7.3.6.2. The back portion of the cassette is called the H-Bar.

7.3.6.3. The cassette is numbered one (1) through twenty-five (25). The numbering starts at the H-bar (1) and works its way to the front (25) of the cassette.

7.4. Loading a Photo Resist Syringe

7.4.1. Make correct adjustments to dispense parameters for a given photo resist.

7.4.1.1. Parameters can be found on the door of the ACS.

7.4.2. When making adjustments to the dispense pressure, you must pull it out, you will hear a click. Turn the pressure off then turn to the parameter you need.

7.4.3. Adjust dispense time by using the buttons **below** the digital display.

7.4.4. Use the small dial to adjust the suck backpressure.

7.4.4.1. If the suck backpressure is set to high there will be bubbles in the photo resist.

7.4.5. Clean the dispense connector on the syringe using IPA. Do not use Acetone, this will dissolve the o-ring.

7.4.5.1. Also place a small amount of vacuum grease on the o-ring after cleaning to ensure the o-ring does not dry out and crack.

7.4.6. Choose the appropriate size needle for the syringe you are using.

7.4.7. After use replace the caps on the syringe.

7.4.8. For a full syringe of 9260 photo resists at a thickness of 12 to 13um you should get five (5) wafers coated.

7.5. Loading Wafers

7.5.1. Know the slot number for the wafer position.

7.5.2. Wafers are loaded with the backside facing the H-bar.

7.5.3. The H-bar on the cassette is placed on the groove. And then push the lock button. The cassette stage will automatically adjust for the substrate diameter.

7.5.4. To unload wafers push the lock bar, this will turn off the green light.

7.5.5. Never open the doors if a process is being run. This will create an error.

7.6. Log In

7.6.1. Ensure no one is using the tool.

7.6.2. To log in or out the user must click on the padlock icon, which is located on the system status pad.

7.6.3. Select the user name from the drop down list.

7.6.4. Enter the correct password.

7.6.5. Choose the appropriate action.

7.6.6. Click ok.

7.7. Operator Panel

7.7.1. The top portion of this panel contains a scrollable list of processes or wafer path files.

7.7.2. The stop/pause/run buttons are only active when a process has been selected.

7.7.3. Select a file name (process) by clicking on it.
7.7.4. Select the appropriate wafers to be coated or developed.
7.7.5. Then choose an operation, stop/pause/run
7.7.6. An icon to the left of the file name will indicate the state of the process.

7.8. Resource Icons
7.8.1. The right hand portion of the system status page contains an icon (status panel) for each of the system resources.
7.8.2. Panels will change in real time to display general status information.
7.8.3. For a more detailed status screen you can either double click on the resource icon or right click on the icon.

7.9. Edge Bead Removal
7.9.1. This operation places a small stream of resist solvent (NANO EBR) at the edge of the wafer (about 2mm from edge) to remove the edge bead created at the spin coat operation.
7.9.2. The edge bead step should be performed after the bake step. If performed after the coat step, you may thin out the resist.

7.10. Cotton Candy
7.10.1. The ACS performs a self clean of the bowl after a batch to help in removing any cotton candy.
7.10.2. NANO EBR is used to clean the bowl.

7.11. Automatic Dispense
7.11.1. Shipley 1813 is automatically dispensed, which means there is no syringe.
7.11.2. Typically 4 to 5mL of Shipley 1813 is dispensed onto the substrate.
7.11.3. Prior to the first substrate being coated there is a pre-dispense to remove any dried photo resist from the needle.
7.11.4. Nozzle clean is programmed into all the coat steps.

7.12. Errors
7.12.1. If you receive any errors on the system, make a note of it and call the tool owner.

8. **Waste Products**

8.1. Broken wafers are to be discarded in the glass trash. Do not wrap in clean room wipes.

- **Report all accidents (injuries, spills, fires) to the SSEL On Call or other SSEL staff. For emergencies during non-business hours, call the SSEL Emergency Response Team at (734) 764-4127 or Department of Public Safety at (734) 763-1131.**