

Wet Photoresist Stripping

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.

Revised: June 6, 2007

Warning: Microposit Remover 1165 (Rohm & Haas) is a combination of solvents including N-methyl-2-pyrrolidine. It will cause burns and irritation if it contacts your skin or eyes. Avoid breathing the vapors. Acetone and isopropanol are flammable, volatile solvents. Avoid heat sources and avoid breathing the vapors.

1. Material Requirements:

1.1 Equipment: Two 1000 mL glass beakers for rinsing. Stainless steel 4" wafer tweezers and PTFE wafer handling tools. Solvent waste bottle (4L HDPE). Possibly two 1000 mL glass beakers for Remover 1165 processing. Possibly hotplate and PTFE coated thermometer.

1.2 Chemicals: Microposit Remover 1165 (Rohm & Haas)

1.2.1 Remover 1165 (Rohm & Haas): A solvent mixture including N-methyl-2-pyrrolidine. It is flammable with a flashpoint of 88°C (that is, at and above 88°C the fumes ignite explosively by a spark or open flame.)

1.2.2 Acetone is a volatile, flammable solvent. Avoid heat sources. Do not breath fumes. Conduct processing in the fume hood.

1.2.3 Isopropanol is a volatile, flammable solvent. Avoid heat sources. Do not breath fumes. Conduct processing in the fume hood.

1.3 Engineering Controls: Conduct procedure in ventilated fume hood. Store bottles of chemicals (sealed tightly) in the solvent cabinet with secondary containment. Work area should contain an eye wash and safety shower.

1.4 Personal Protective Equipment: Trionic gloves on top of nitrile gloves, apron, chemical goggles, and face-shield.

2.0 Procedure:

This etch will remove positive photoresist from your wafer. Sometimes the resist can become difficult to remove if it has been exposed to high temperatures or energetic plasmas. In that case, a high power oxygen plasma clean prior to wet strip may help.

Complete all processes in the fume hood.

2.1 Initial Photoresist Strip

2.1.1 Bring the solvent waste bottle into the hood and put a plastic funnel in it. (If there is no solvent waste bottle or the solvent waste

is full, put a red hazardous waste tag on an empty 4L HDPE bottle and label "Solvent Waste").

- 2.1.2 If needed, refill the acetone and isopropanol squirt bottles from the 4L bottles in the solvent cabinet.
- 2.1.3 Put your wafer in a PTFE 4" wafer holder paddle.
- 2.1.4 Hold the wafer over the funnel in the solvent waste bottle, and spray down the wafer (both sides) with acetone from the squirt bottle. Try to rinse from the top side down. You should see the resist cleaning off.
- 2.1.5 Rinse the acetone off the wafer with isopropanol from the isopropanol squirt bottle (again, rinse into the solvent waste bottle). Your goal is to rinse off the acetone with isopropanol before the acetone dries.
- 2.1.6 Blow dry the wafer with the air gun.
- 2.1.7 Examine, if it is clean enough, you are done.
- 2.1.8 Cap the solvent waste bottle and put it back under the hood.

2.2 Remover 1165 Clean (Room Temperature)

Note: For a higher quality clean, you may choose to use heated Remover 1165. In that case, skip down to section 2.3 below.

- 2.2.1 Put the wafer (still in the 4" PTFE wafer holder) into the tank of Remover 1165 at the back of the hood. Hook the end of the holder onto the edge of the tank.
- 2.2.2 Allow the wafer to soak for 5-10 minutes.
- 2.2.3 Bring the solvent waste bottle into the hood and put a funnel in it.
- 2.2.4 Fill a 1000 mL beaker (for solvent rinse) with deionized water.
- 2.2.5 Remove the wafer from the Remover. Rinse with isopropanol and water from squirt bottles directly into the solvent waste bottle (using a funnel). Also rinse off the PTFE wafer holder with IPA and deionized water into the solvent waste bottle.
- 2.2.6 Put the wafer into the beaker of water (still in the 4" PTFE holder). Soak for 3 minutes.
- 2.2.7 Remove the wafer from the rinse and dry it with the air gun. Additional drying can be performed in the 120 °C oven if desired.
- 2.2.8 The wafer should now be clean of resist. Examine under the microscope.
- 2.2.9 Dispose of the rinse water in the solvent waste bottle.

2.3 Remover 1165 Clean (Elevated Temperature)

Note: For a very high quality resist strip, you may choose to do two heated Remover steps; one initial strip, and one final clean. In that case, set up two identical heated containers following the instructions below.

- 2.3.1 Pour enough Remover 1165 to cover your sample(s) into a glass beaker or glass Petri dish.
- 2.3.2 Cap the bottle and return it to the solvents cabinet.

- 2.3.3** Put a dirty hotplate (“SU-8 Allowed”) in the hood. Cover the surface with aluminum foil. (If there is already foil on the hotplate, replace it if it is getting dirty otherwise, use it as is)
- 2.3.4** Put the glass container that you just poured onto the hotplate.
- 2.3.5** Set the hotplate to 80 °C. DO NOT SET THE HOTPLATE ABOVE 88 °C!!!
- 2.3.6** Allow the container to warm up. (~10 mins, depending on quantity of material). You can measure the temperature with the PTFE coated thermometer... if you do this make sure to rinse the thermometer with water before returning it to the shelves!
- 2.3.7** Transfer the sample into the Remover 1165 carefully with tweezers or PTFE wafer tools.
- 2.3.8** Let the sample soak for 10 mins.
- 2.3.9** Turn off the hotplate. Allow the Remover to cool for 30 mins before removing it from the hotplate.

Note: For a very high quality resist strip, you may choose to do a second final clean in a second heated Remover 1165 solution. In that case, transfer to the second cleaning container after finishing the first resist strip..

- 2.3.10** While the sample is etching, fill two glass 1000 mL rinse beakers with enough DI water to cover the sample.
- 2.3.11** When the etch is complete, transfer the sample carefully to the first rinse beaker with tweezers or PTFE wafer tools.
- 2.3.12** Leave the tweezers/tools (which have solvent on them now) to soak in the DI water beaker with the sample.
- 2.3.13** Let the sample and tweezers soak for 5 mins.
- 2.3.14** Transfer to the second rinse beaker.
- 2.3.15** Let the sample and tools soak for 5 mins.
- 2.3.16** Remove your sample and blow it dry with the air gun.
- 2.3.17** After removing the majority of the water with the air gun, you can further dry your wafers on a hotplate or in the convection oven if needed.
- 2.3.18** After it has cooled for 30 minutes, dispose of the Remover 1165 and the rinse water in the solvents waste bottle.
- 2.3.19** Rinse all the containers a second time with deionized water and pour it into the solvents waste bottle.
- 2.3.20** Return all labware to its proper location. The beakers can drip dry on fab wipes in the hood or on the shelves.
- 2.3.21** Wipe up any drips in the area with chemical wipes and dispose in the solvent trash.

3.0 Storage:

- 3.1** Remover 1165, Acetone, and Isopropanol 4L bottles should be stored in a closed, capped bottle in secondary containment in the solvent cabinet.
- 3.2** Acetone and isopropanol squirt bottles stay in the hood.
- 3.3** The Remover 1165 tank stays in the back of the hood.

4.0 Waste Disposal:

4.1 Solvent waste (Remover 1165, acetone, isopropanol, and rinse water):

4.1.1 Wipes are disposed of in the solvent trash can.

4.1.2 Liquid waste and rinse water are collected in the solvent waste bottle.

5.0 Accident Procedures:

5.1 Contact: Read MSDS prior to working with any chemical to familiarize yourself with the symptoms of exposure and recommendations for treatment.

5.1.1 Remover 1165:

5.1.1.1 Skin contact: Rinse affected area with water for 15 minutes, removing contaminated clothing during the rinse. If burning and irritation persist, contact Tufts health services.

5.1.1.2 Eye contact: Immediately flush with water for 20 minutes while holding the lids open. **Get immediate medical attention. Call Tufts Emergency Medical Services at x66911.**

5.1.1.3 Ingestion: Do not induce vomiting. **Get immediate medical attention. Call Tufts Emergency Medical Services at x66911.**

5.1.1.4 Inhalation: Remove to fresh air. **Get immediate medical attention. Call Tufts Emergency Medical Services at x66911.**

5.2 Spill:

5.2.1 If a small, contained spill occurs, such as inside the hood, wipe it up with chemical wipes and dispose of in the appropriate trash container (solvent trash).

5.2.2 If a large spill occurs that you are not comfortable cleaning up, turn off hotplates, evacuate the lab and notify the Tufts emergency services (x66911) immediately. Clean up should only be performed by authorized personnel according to MSDS guidelines. Notify the faculty advisor.

5.3 Fire:

5.3.1 If a fire starts, use the fire extinguisher to put it out. Evacuate the lab and contact the faculty supervisor.

5.3.2 If you are not able to quickly extinguish the fire using the fire extinguisher, immediately evacuate the lab and call **Tufts Emergency Services at x66911.**

If at any time you feel a situation is dangerous, do not hesitate to call the safety office (x73246, Peter Nowak) or the faculty supervisor (x72210, Robert White).

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