

Copper Etch

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: January 23, 2009

Warning: Ingestion of Transene copper etchant may cause irritation to mouth and stomach. Prolonged exposure may cause skin sensitization.

1. Material Requirements:

1.1 Equipment: One glass Petri dish, two 1000 mL glass beakers (for rinse), stainless steel tweezers, PTFE (Teflon) wafer holders or sample holders.

1.2 Chemicals: Transene Copper Etchant Type APS-100 (CE-100) (contains 15-20% Ammonium Persulfate and Water)

1.2.1 Hazards associated with chemicals:

1.2.1.1 Oxidizer. Decomposes in storage under conditions of excessive heat causing release of oxides of sulfur, nitrogen and oxygen that supports combustion. Decomposition could form a high temperature melt.

1.2.1.2 Ingestion may cause irritation to mouth and stomach.
Prolonged exposure may cause skin sensitization.

1.3 Engineering Controls: Store bottles of chemicals (sealed tightly) in cabinets with secondary containment. Work area should contain an eye wash and safety shower. All processing should be performed in the chemistry fume hood.

1.4 Personal Protective Equipment: Nitrile gloves and safety glasses.

2.0 Procedure:

Complete all processes in the fume hood

2.1 Copper Etch

2.1.1 Get two water rinse beakers which will fit your samples (A 1000 mL beaker works for a single 4" wafer.) **Do this first.** If something goes wrong, you want the water available to quench the reaction.

2.1.2 Fill the rinse beakers with deionized water such that the water level will cover the entire sample.

2.1.3 Place a couple of fab wipes in a pile in the hood. Get a glass Petri dish that will fit your samples for processing (you should find one labeled "Copper Etchant" on the shelves). Put it on the fab wipes in the hood.

2.1.4 Carefully pour some of the Transene Copper Etchant Type CE-100 into the Petri dish such that the dish is a little over half full.

2.1.5 Calculate the etch time for your sample. You will need to know the thickness of your copper layer. At 20°C, the Copper will etch at a rate of approximately 40 nm/sec. This may not be exact! Testing it for yourself is a good idea.

2.1.6 Put your wafer into the etchant and soak for the appropriate amount of time calculated in the previous step. Careful swirling of the Petri dish will accelerate the etch and improve uniformity.

2.2 DI water rinse:10 min:

2.2.1 When the etch is complete, transfer the sample carefully to the first DI water rinse beaker

2.2.2 If you used tweezers to move the sample, make sure you leave them in the rinse beaker to rinse as well.

2.2.3 Let the sample and tools soak in DI water for 5 mins.

2.2.4 Transfer the sample to the second DI rinse beaker, and rinse for another 5 mins.

2.3 Sample dry:

2.3.1 After the water rinse is finished, remove your samples and blow them dry with the gun.

2.3.2 Inspect wafer for traces un-etched copper. If features are small, use an optical microscope. If more etch time is required, place wafer back into the Petri dish with the etchant for another 30 seconds while swirling. Repeat rinse and drying procedure.

2.4 Clean-up:

2.4.1 The etchant may be used for multiple etches. For temporary storage (< 1 day), place the top of the Petri dish over the etchant and store on fab wipes in the back of the hood. Make sure the dish is clearly labeled “Copper Etchant”

2.4.2 When you finish using the etchant, dispose of it in a HDPE or glass bottle, label “Cu Etch APS-100 : Ammonium Persulfate” with the red hazardous waste tag. Keep the bottle in the satellite accumulation area (under the hood). If a waste bottle already exists, use that one, otherwise start a new one.

2.4.2.1 Do NOT mix copper etch waste with other acids, bases or solvents.

2.4.3 Rinse the Petri dish once with DI water, and dump it into the Cu Etch waste bottle.

2.4.4 Dump the first DI rinse beaker into the Cu Etch waste bottle.

2.4.5 Dump the second DI rinse beaker into the 5 gallon HDPE “Dilute Acid Waste” container.

2.4.6 Rinse all three containers a second time with with DI water. This time, dump them into the 5 gallon HDPE “Dilute Acid Waste” container.

2.4.7 Return all lab ware to its proper location. The Petri dish and the beaker can drip dry on fab wipes in the hood or on the shelves.

3.0 Storage:

3.1 Keep container tightly closed. Store on corrosion-proof area.

4.0 Waste Disposal:

4.1 Chemical: Transene Copper Etchant Type CE-100

4.1.1 Solid waste for chemicals should go in the acid waste bin.

4.1.2 Liquid waste for chemicals should go in the Cu Etch waste bottle. This container can be glass or HDPE.

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 Chemical: Transene Copper Etchant Type CE-100

5.1.1.1 CALL A PHYSICIAN. If swallowed do not induce vomiting; If conscious, give water, milk or milk of magnesia.

5.1.1.2 If inhaled remove to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen.

5.1.1.3 In case of contact immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

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.

5.2.2 If a large spill occurs that you are not comfortable cleaning up:

5.2.2.1 If it is a **chemical** spill, do this. Notify the Tufts emergency services (x66911) immediately. Also notify the faculty advisor.

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.