Titanium Etching #2 : Transene TFTN (HCl based) Etchant
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 (on campus) or 617 636 6911 (off campus or cellphone).

Revised: October 8, 2011

Warning: Avoid contact with skin and eyes. Do not ingest. Do not breathe the vapors. Work carefully in the hood with goggles, face shield and rubber gloves. Avoid release to the environment.

1. Material Requirements:

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

1.2 Chemicals: Transene TFTN Titanium Etch. Contains Hydrochloric Acid & Water

1.2.1 Hazards associated with chemicals:

1.2.1.1 This material is corrosive to the eyes, skin and mucous membranes and causes irritation. Vapors severely irritate the respiratory tract.

1.2.1.2 Separate from metals, alkali, and organics.

1.3 Engineering Controls: Conduct procedure in ventilated fume hood. Store bottles of chemicals (sealed tightly) in cabinets 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, goggles, and face-shield.

2. Procedure:

Complete all processes in the fume hood.

2.1 Titanium Etch: variable time

2.1.1 Get two a water rinse beakers which will fit your sample.

2.1.2 Stand the rinse beakers on a few fab wipes in the hood, and fill them with deionized water such that the water level will cover the entire sample.

2.1.3 Place a couple 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 "Titanium Etchant" on the shelves). Put it on the fab wipes in the hood.

2.1.4 Carefully pour some of the TFTN Titanium etchant 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 Titanium layer. At 70°C the etch rate is 10Å/sec and at 85°C it is 50Å/sec. This may not be exact! Testing it by yourself is a good idea.

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

2.3 Cleanup

2.3.1 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 with your name, "Titanium Etchant" and the date.

2.3.2 If you do not plan to do another etch in the near future, transfer the etchant carefully into Titanium etchant waste container. The waste container should be labeled with "Hydrochloric Acid" and "water".

2.3.3 Pour the first rinse beaker into the process container, swirl around a bit, and dump that into the Titanium etchant waste as well.

2.3.4 Dump the second DI rinse beaker into the 5 gallon HDPE "Dilute Acid Waste" container.

2.3.5 Finally, rinse all containers one last time with fresh DI water, and pour the rinse water into the dilute acid/base waste (5 gallon HDPE jug).

2.4 Return all lab-ware to its proper location.

2.5 Wipe up any drips in the area with chemical wipes and dispose in acid trash.

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3. Storage:

3.1 Titanium etchant TFTN should be stored in the acid cabinet.

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4. Waste Disposal:

4.1 Titanium etchant TFTN waste:

4.1.1 Solid waste should go in the acid waste bin.

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

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5. Accident Procedures:

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

5.1.1 HCl Acid or mixed HCl/Water solution:

5.1.1.1 Eye Contact: Corrosive to naked eye; in case of contact flush eyes well for 15 minutes, lifting the lower and upper eyelids occasionally. It may cause permanent eye damage or blindness. Seek medical attention. **Call Tufts Emergency Medical Services are at x66911 (campus phone) or 617 636 6911 (off campus or cellphone).**

5.1.1.2 Skin Contact: Obtain medical attention: Corrosive to exposed skin. Flush skin well with water for 15 minutes, wash with soap and water. Remove affected clothing, get medical attention. It may cause deep, penetrating burns. **Call Tufts Emergency Medical Services are at**

x66911 (campus phone) or 617 636 6911 (off campus or cellphone).

5.1.1.3 Inhalation: If inhaled, remove to fresh air. If not breathing give artificial respiration. Seek medical attention. Inhalation of vapors may cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract. In severe cases, may pulmonary edema, circulatory failure, and death. **Call Tufts Emergency Medical Services are at x66911 (campus phone) or 617 636 6911 (off campus or cellphone).**

5.1.1.4 Ingestion: Will cause severe burns to the mouth and severe and permanent damage to the digestive tract. It causes gastrointestinal burns and perforation of the digestive tract. Get Medical Attention immediately. Do not induce vomiting; give large quantities of water. **Call Tufts Emergency Medical Services are at x66911 (campus phone) or 617 636 6911 (off campus or cellphone).**

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 or acid).

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

5.2.2.1 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. 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.