

TFB Nickel 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.

Revised: May 4, 2018

Warning: Transene TFB is acutely toxic. Significantly corrosive. Can cause severe skin burns, serious eye damage, damage to mucous membranes through prolonged exposure.

1. Material Requirements:

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

1.2 Chemicals: Transene TFB Nickel Etchant (contains Nitric Acid (15-20%), Proprietary Surfactant (<1%), Water (80-85%))

1.2.1 Hazards associated with chemicals:

1.2.1.1 Corrosive to metals. Acutely toxicity with oral ingestion.

Fatal if inhaled. Severe skin burns may occur upon contact. Serious eye damage and eye irritation may occur. May cause damage to lungs, eyes, and mucous membranes upon repeated exposure. Strongly incompatible with organics due to nitric acid.

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: Trionic gloves on top of nitrile gloves, apron, goggles, and face shield.

2.0 Procedure:

Complete all processes in the fume hood

2.1 Nickel Etch

2.1.1 Get one 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 beaker 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 "Nickel Etchant TFB" on the shelves). Put it on the fab wipes in the hood. **Be careful not use the petri dish labeled Nickel Etchant TFG**

- 2.1.4 Carefully pour some of the Transene TFB 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 nickel layer. At 40°C, the Nickel will etch at a rate of approximately 50 nm/sec. This may not be exact! Testing it for yourself is a good idea. Usually 1 – 2 hours is a good estimate. It will start dissolving SU-8 if it is left longer.
- 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: 5 min

- 2.2.1 When the etch is complete, transfer the sample carefully to the 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.

2.3 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 nickel. 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 When you finish using the etchant, dispose of it in a HDPE or glass bottle, label on top “Nickel Etchant TFB” with the red hazardous waste tag. Write down the chemicals, Nitric Acid and nickel oxide and check off corrosive hazard. 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.
 - 2.4.1.1 Do NOT mix nickel TFB etch waste with other acids, bases or solvents. **Do NOT mix with Nickel TFG etch waste.**
- 2.4.2 Rinse the Petri dish once with DI water, and dump it into the Ni Etch waste bottle.
- 2.4.3 Dump the first DI rinse beaker into the Ni Etch waste bottle.
- 2.4.4 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 in acid cabinet.

4.0 Waste Disposal:

4.1 Chemical: Nickel Etchant TFB

- 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 Ni TFB 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 Nickel Etchant TFB

Medical Emergencies require notification to Tufts PD at 6-6911.

5.1.1.1 If inhaled remove to fresh air and seek medical attention. If breathing is difficult notify Tufts PD at 6-6911.

5.1.1.2 In case of contact with skin immediately flush with water for at least 15 minutes with shower or drench hose and remove any contaminated clothing. Seek medical attention and depending on extent of exposure, emergency medical attention may be needed thus Tufts PD should be contacted.

5.1.1.3 In case of contact with eyes and/or face immediately flush with eye wash for 15 minutes. Any eye or face exposure should be considered a medical emergency and TUFTS PD should be notified at 6-6911.

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.