Silver Nanoparticle Deposition

Standard Operating Procedure

Lab Manager: Dr. James Vlahakis
Faculty Supervisor: Prof. Robert White, Mechanical Engineering (x72210)
Tufts Emergency Medical Services are at x66911.

For more information:

Kumar, A., K. Kashyap, et al. (2014). Super hydrophobic/super hydrophilic transparent nanostructured glass fabricated by wet etching. 2014 9th IEEE International Conference on Nano/Micro Engineered and Molecular Systems (NEMS), 13-16 April 2014, Piscataway, NJ, USA, IEEE

Revised: December 10, 2014

Purpose: This process will deposit silver nanoparticles on a silicon substrate. This can be used with metal assisted chemical etching to produce silicon nanorods.

1. Material Requirements:

1.1 Equipment: Glass beaker, tweezers

1.2 Chemicals: Silver Nitrate 0.100M (0.100N)

1.2.1 Hazards associated with this chemical:
Liquid or vapors are serious health hazards and can cause severe burns. Do not breath fumes. Conduct processing in the fume hood.

1.3 Engineering Controls: Conduct procedure in ventilated fume hood. Store silver nitrate in solvents cabinet.

1.4 Personal Protective Equipment: Nitrile gloves, safety glasses.

2.0 Procedure:

This procedure is intended for use on a silicon substrate that is clean and has had the native oxide layer removed. An RCA Clean should be performed just before the silver nitrate treatment. For information on performing an RCA Clean, see the RCA SOP. Hydrofluoric acid is extremely dangerous. Do not handle HF without proper training.

Complete all processes in the acid process fume hood.

2.1 Wafer Clean:

2.1.1 Perform an RCA Clean (see RCA Clean SOP) on a silicon substrate.

2.2 Nanoparticle Deposition:

2.2.1 Place the substrate in a glass dish. Pour in enough silver nitrate (0.100M) to cover. Wait 5 minutes.

2.2.2 Remove the substrate. Let dry in the fume hood.

2.2.3 Dispose of the silver nitrate in a dedicated waste bottle. Rinse the dish at least twice with water. Dispose of the water in the same waste bottle.

3.0 Cleanup:

3.1 Return all labware to its proper location. The dish can drip dry on fab wipes in the hood or on the bottom shelf of the storage shelving.

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

4.0 Storage:

4.1 Silver nitrate is stored in the solvents cabinet.

5.0 Waste Disposal:

5.1 Silver nitrate waste:

5.1.1 Wipes are disposed of in the acid trash can.

5.1.2 Liquid waste is collected in the dedicated waste container and stored in the satellite storage area with secondary containment.

6.0 Accident Procedures:

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

6.1 Silver nitrate:

6.1.1 Skin contact: Wash with soap and water.

6.1.2 Eye contact: Flush eyes with flowing water for at least 15 minutes. Contact emergency personnel.

6.1.3 Ingestion: Wash out mouth with water. Do not induce vomiting. Contact emergency personnel.

6.1.4 Inhalation: Remove to fresh air. If breathing is difficult, contact emergency personnel.

6.2 Spill:

6.2.1 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 (acid trash).

6.2.2 If a large spill occurs that you are not comfortable cleaning up, 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) or the faculty supervisor (x72210, Robert White).

Report all accidents (injuries, major spills, fires) to the safety office at x73246 and the faculty supervisor at x72210 (Robert White).

For emergencies, call Tufts Emergency Services at x66911.