HF (2%) DIP

INRF application note
Process name: HFDIP

Overview
Dilute hydrofluoric acid (HF) is used to remove native silicon dioxide from wafers. Since it acts quickly, one needs to only expose the wafer for a short time ("dip"). HF is a dangerous chemical and protective gear must be worn when using it, in particular, *neoprene or thick nitrile gloves and eye protection must be worn.* This note describes how to prepare a 2 % solution. This is a level-1 process and requires basic INRF safety certification. The use of dangerous chemicals requires that the user may not perform the process alone.

Time needed

Setup time for this process is about 5 minutes. This process takes about 5 minutes to complete.

Materials needed

Extra heavy gloves
Polymer beaker (Teflon or polypropylene)
20 ml HF (49%)
Small polypropylene graduated cylinder (for 20 ml)
Large graduated cylinder (for 500 ml)

Preparation

Setup time for this process is about 5 minutes. This process takes about 5 minutes to complete.

You will need to measure the following:

480 ml water
20 ml HF (49%)

Wear heavy protective gloves and protective eye gear. Add 480 ml water to polypropylene beaker then, add 20 ml HF. NEVER US A GLASS BEAKER with HF since HF attacks glass. Label the bottle "2% HF solution – Dangerous acid" then, add your name and the date.

Procedure

Soak the wafer for 1-2 minutes in the 2% HF solution. Remove the wafer and rinse in running DI water. Check for hydrophobicity by performing a wetting test. Pour a little DI water on the surface. If the water beads up and rolls off, the surface is hydrophobic and water will not wet it. Since oxide is hydrophilic and pure silicon is hydrophobic, a

non-wetting surface is clean of oxides. Blow dry with nitrogen and store in a clean, dry environment.

The 2% solution may be saved for other cleaning (it does not lose its effectiveness). To dispose the 2% HF solution, pour into an INRF labeled waste container for 2% HF. Very small amounts of 2% HF may be disposed by diluting with cold water, then flushing down the drain with plenty of cold water.

Rinse beakers thoroughly with water when finished. Be sure to wash your neoprene or heavy nitrile gloves and return to their proper location when finished.

Clean up

Rinse all beakers, graduated cylinders, mixers and lab ware with cold water. Wipe up any spills. Rinse outer gloves and hang to dry.

Safety and emergency

All INRF safety and procedural regulations must be followed. Hydrofluoric acid (HF) is an extremely toxic and dangerous acid. Use of HF requires at least one other person in the clean room (buddy system). HF should be handled in a laminar flow bench, using two pairs of nitrile gloves (or neoprene) and eye protection. Any small spills should be wiped up immediately with wipes and rinsed. Dispose the wipes in the corrosive container. DO NOT LEAVE the etchant unattended.

A special INRF Standard Operating Procedure for HF has been prepared. Follow the INRF SOP for HF exposure (summarized below).

In case of exposure **seek medical attention immediately**! For skin exposure, flush immediately with water for 5 minutes, followed by liberal application of calcium gluconate gel to the skin. Remove all clothing that are exposed before and while flushing with water. For eye exposure, flush eyes with water three times, 5 minutes each. Irrigate the eye repeatedly with 500-1000 ml of a 1% calcium gluconate solution applied through a syringe. Call for prompt emergency room treatment. Apply ice-water compresses during transport.

In case of large spill, follow the INRF Standard Operating Procedure for chemical spills.

References

W. Kern and J. Vossen, *Thin Film Processes,* Academic Press: New York, 1978, Ch V-1.

Northwestern university Office of Research Safety (ORS) safety documents, http://www.northwestern.edu/research-safety/indexx.htm.

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HF (2%) Dip

Check list

Neoprene gloves required for HF dip

Prepare 2% solution, 480 ml water + 20 ml 49% HF (add acid to water)

Dip wafer in 2% HF solution, 1-2 minutes

Perform wettability test

DI rinse/blow dry

Clean up, dispose of wastes