Lieberman lab CMOS "not so clean" cleaning procedure Room 270 Stepan

Location: The MOS cleaning hood is the one farthest from the door. All MOS clean activities must be carried out only in this location. Please wash the work area down after use.

PPE: In addition to your splash goggles, lab coat, and a fresh (clean) pair of blue gloves, while at the cleaning bench you must don full battle gear: rubber apron, face shield, and gauntlet gloves (heavy nitrile ones, NOT the yellow rubber gloves used for washing dishes). Check the nitrile gloves to ensure they don't have any holes; if you need a new pair, they are in the central lab bench cabinet closest to the door. HF bottles including waste bottles should always be located in a plastic tub--you should never have an HF bottle sitting out on the benchtop. If you are working with HF, locate the tube of calcium gluconurate ointment and the calcium hydroxide squirt bottle in case of spills.

Chemicals needed: 18 MOhm resistivity water (can get from Biochem labs on 4th floor). Concentrated NH4OH, concentrated HCl, concentrated HF (keep acids under clean hood in plastic tubs; base is located under the next hood over). 30% H2O2 (keep in fridge, replace after 9 months use).

Equipment: Plastic measuring beaker to make up baths, plastic dunk bucket, plastic tweezers, squirt bottle with 18 MOhm water, wash beaker (250 ml), waste beaker (500 ml), waste bottles for RCA 1, RCA 2, and HF.

Procedure:

1) Sign and date the log form on the wall. Record what you do on the log form.
2) Check the RCA baths and make up new ones if needed (they are good for 3 days). Old bath solutions should be disposed of in the appropriate waste containers. When measuring reagents by volume, use the plastic measuring beaker.
    ~105 ml RCA 1 (base): place 75 ml water in the beaker, and add 15 ml of conc. NH4OH (smelly).
    ~120 ml RCA 2 (acid): place 90 ml water in the beaker, and add 15 ml of conc. HCl.
3) Turn the heat on and bring the RCA baths to 70˚C. Add 15 ml of 30% H2O2 to each bath. Use within 1 hour. The bath can be reused several times if 15 ml of peroxide is added each time.
4) Fill the plastic wash beaker with 100 ml water. Place the wash beaker and rinse beaker into a plastic tub.
5) Place your chip(s) into the plastic dunk bucket and lower into RCA 1 for 10-20 min. You should see bubbles forming on the chips; if not, the peroxide may be bad. Lift the bucket up and drain well. Move the bucket over the waste beaker and rinse thoroughly with 18 MOhm water from the squirt bottle. Immerse in the wash beaker and jiggle up and down for 20 seconds. Drain and rinse again with the squirt bottle. Dump the wash water into the rinse beaker, and refill the wash beaker with water. Pour the contents of the 500 ml rinse beaker into the RCA 1 waste bottle.

6) Place the dunk bucket into the 1:50 HF in the white HF beaker for 10-20 sec. Place the wash beaker and rinse beaker into a plastic tub. Use a gentle up and down motion to mix the chips and HF. Lift the dunk bucket to allow the HF to drain away. The chips should now be totally hydrophobic, repelling the HF solution. If they are not, dip them a few more seconds. Move the bucket over the rinse beaker and rinse will with the squirt bottle, then dunk in the wash beaker and agitate for 20 seconds. Drain and rinse with the squirt bottle. Dump the wash water into the rinse beaker, and refill the wash beaker with water. Pour the contents of the 500 ml rinse beaker into the HF waste bottle.

7) Lower the dunk basket into the RCA 2 solution for 10-20 min. Lift the bucket up and drain well. Move the bucket over the waste beaker and rinse thoroughly with 18 MOhm water from the squirt bottle. Immerse in the wash beaker and jiggle up and down for 20 seconds. Drain and rinse again with the squirt bottle. Dump the wash water into the rinse beaker, and refill the wash beaker with water. Pour the contents of the 500 ml rinse beaker into the RCA 2 waste bottle. Leave the chips soaking in the wash beaker.

8) Remove each chip from the basket with plastic tweezers, rinse with water, and blow dry with nitrogen. Place in plastic wafer box.

9) Clean up work area, wash exterior of CMOS gloves, take them off to dry, and label any full waste bottles for waste disposal (take down to 275).

HF bath: The 1:50 HF:H2O solution is good for several months. Dispose of old solution by pouring it into the HF waste bottle.

To make a new solution: ~100 ml HF (50 x dilution): Place 50 ml water in the plastic HF beaker. Measure 4 ml conc HF (49%) in the plastic measuring beaker and add to the HF beaker. Rinse out the plastic measuring beaker with a total of about 50 ml water, adding the rinse water to the HF beaker. Wash out the measuring beaker thoroughly with water.

HF safety hazards: conc HF is bad stuff; in addition to your normal acid burn it is toxic and can cause bone damage. We handle it using "full battle gear" in the hood, and always use containment (plastic tubs) to prevent a spill from getting away. The 50:1 diluted HF and buffered HF solutions are much less hazardous, but still must be handled with full precautions.

If you spill these materials, let Dr. L know even if there is no exposure of your person and you clean the spill up. Small spills can be cleaned up by mixing them with excess calcium from the squirt bottle (this forms insoluble CaF2) and soaking up the mess on paper towels; scoop the towels into a plastic tub and label as hazardous waste for pickup. HF on the skin should be first rinsed with copious water, then the calcium ointment applied. Concentrated HF on skin/clothing/shoes merits REMOVAL of the clothing and rinsing or showering the underlying skin. Bag the clothing as hazardous waste. A spill of concentrated HF that is NOT contained in a plastic tub, or **any amount** of concentrated HF on your skin merits calling risk management or ND emergency 1-5555 or 911.

Dr L home phone number: 574-287-5698

5/15/2013 ML