Oxide

STANDARD OPERATING PROCEDURE

CORAL Name: *oxide*

Model Number: oxide etch sink

Location: ICL

What it does: wet station

Introduction: Buffered Oxide Etch (BOE) is used to etch patterns in SiO2 (oxide) or to strip the oxide from wafers. The ICL machine "oxide" is limited to 4" and 6" Si or SiGe whole wafers. No pieces, No gold, No metals.

The user transfers wafers to teflon cassettes and immerses them in the liquid etchant for a predetermined time. Then they are rinsed with DI water and dried.

Safety: Buffered Oxide etchant is a clear, odorless liquid which contains Hydrofluoric acid (HF). HF is a corrosive and should be treated as extremely hazardous. Exposure to the eyes of small amounts may cause severe damage or blindness very rapidly. Exposure to skin may cause bone decalcification.

Skin exposure to liquid HF is made more dangerous by the fact that there is no instant reaction typical of other corrosives such as sulfuric or phosphoric acid. HF acid will absorb into the skin with little discomfort and attack deep tissue and bone. Thus the pain and damage associated with these deep burns comes hours after exposure and too late for preemptive (topical) treatment.

Therefore, any exposure to an unknown wet substance while working at the oxide sink must be assumed to be BOE and treated as such, by applying the antidote gel provided, to the exposed area immediately.

DO NOT ASSUME AN UNKNOWN WET SUBSTANCE IS WATER.

The Personal Protective Equipment (PPE) required to work at any wet etch sink includes:

- Rubber Gloves: the orange gloves labeled Puretek, not the yellow solvent gloves (Nytek). There are different sizes, use the best fit. Rubber gloves are worn over the vinyl, general use gloves.
- Arm shields: Worn over the rubber gloves.
- Green Apron: Acid resistant. The front label should be worn out not against the clean suit. One size fits all. Tie back straps tightly.
- Safety glasses: To be worn at all times throughout the lab. These are not an alternative to the faceshield.
- Faceshield: To be worn, pulled down, while at the wet sink. Not a substitute for safety eyeglasses, both must be worn.

The PPE is kept in the wet etch bay and is meant to be shared. However, do not use any equipment which is wet or ripped or stained or questionable or does not fit well.

New PPE is available in the glove room or by asking a staff member. Face- shields should be changed whenever they become stained.

Other Safety notes:
Before working at any wet etch sink familiarize yourself with the location of the safety shower/eyewash station as well as the eyewash hose and DI water hose at the sink.

Loss of cleanroom air movement or power failure may mean loss of fume exhaust. Therefore all

users should leave the lab if this occurs. Unusual quiet or air whistling is a sign of loss of air handling capability.

Procedure:

1. Check Equipment Reservations in CORAL to insure that you reserved the correct machine in the correct facility for the correct date.
2. Engage machine for the equipment that you are Using. Insure that the correct facility is set (ICL or TRL) and that your lot name is entered correctly. Enter the number of wafers in the comments field.
3. Determine the etch time to use (based on etch rate and film thickness).
4. Put on all personal protective equipment listed above.
5. Transfer wafer to the correct cassette for your bath. Attach correct handle carefully (this is a potential source of accident). Remove lid.
6. Immerse cassette with H-bar to the rear, colored dot to the front. Start timer.
7. Remove cassette carefully when etch time is completed. Place into rinser. Press dump rinser start button. Replace etch bath lid.
8. Remove cassette with handle. Affix dryer cassette handle. Load wafers into spin dryer. Press start. Reset sink timer and shut off dump rinser.
9. Spray down entire area used for processing with DI water hose.
10. Remove personal protective equipment.

Sink Information

The ICL's oxide sink is made up of two separate etch baths with their dedicated dump rinsers and utensils. While the etchant is the same the left side bath and rinser, numbered 1.1, is the DOPED sink and the right side bath, numbered 1.2, is the UNDOPED sink.

The Doped sink is used to pattern or strip oxide films which have been doped in a furnace operation such as phosphorus doping of polysilicon or bpsg deposition. The Undoped sink is used to pattern or strip oxide films not considered doped. (Wafers which have been doped only by ion implant processes are not considered doped.)

The two baths are equipped with a pump and filter system which continuously circulates the etchant through a filter (0.2 um pore) to trap particulates.

The wet station is equipped with automatic dump rinsers positioned directly in front of the etchant bath. Upon completion of the etch, the boat of wafers is pulled up and out of the etchant and placed into the di water dump rinser and the cycle is started.

Other wet sink features include a spin dryer to be used after the dump rinse, process timers and a DI water hose.

Process Information

Buffered Oxide etchants have a long history in the IC industry as etchants for SiO2 films as well as for pre-diffusion and pre-metalization surface cleans.

The ICL uses a 7:1 BOE as its wet oxide etch and diluted HF (unbuffered) for the surface cleans.

Buffered HF has several advantages over unbuffered HF as an etchant, namely improved uniformity, better compatibility with photoresist and greatly increased etch rate. The 7:1 refers to the ratio of Ammonium Fluoride to Hydrofluoric acid.

Etch rates of oxide films will vary due to differences in film densities. Deposited oxides are inherently less dense and etch faster than thermal oxides. In deposited oxides, dep time, temperature, dopant concentration and annealing will all affect degree of densification and hence

the etch rate.

In general, phosphorus-doped films are less dense and etch faster than boron-doped films.

Check with the ICL staff for the specific etch rate for your film or use a representative monitor to determine an etch rate.

Often, the etch is determined to be completed by watching the etchant roll off the wafer leaving it dry-appearing. This is called sheeting and it is effective because the backs of the wafers can be used to visually detect the removal of oxide from patterned wafers. This should be done with the cassette over the dump rinser rather than the etch bath.

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