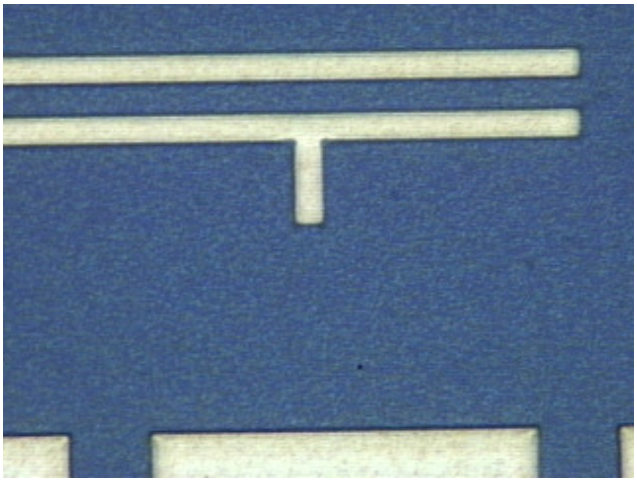
To: MicroE Faculty and Other Users of the SMFL
Date: 5 Aug 2013
From: Dr. Lynn Fuller Webpage: http://people.rit.edu/lffeee

SMFL Users News Letter – Number 130805 V2.2

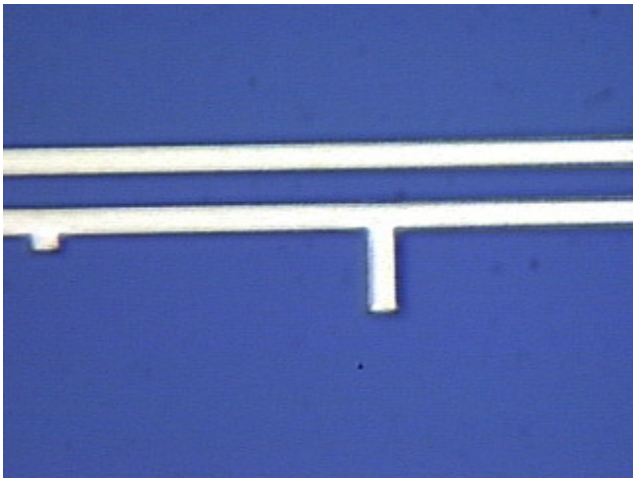
This News Letter is intended to provide information of interest to MicroE faculty and other users of the SMFL. It is a report on equipment and processes used in the SMFL with emphasis on changes, problems, and details that may not be generally available to users. I distribute this to the MicroE faculty and others. If you feel that this News Letter has some information that might be useful to your graduate students please forward it to them. All of the newsletters will be posted on Dr. Fuller's webpage.

Aluminum, Aluminum 1% Silicon, Aluminum Etch, Freckle Etch:

We often deposit Al 1%Si or pure Al on our wafers. If we wet etch the Al 1%Si small freckles are sometimes visible when using 50X or higher optical microscope. I think that this is from the 1%Si that is left behind. These freckles might not be harmful. Our Aluminum etch is Fujifilm Electronic Materials 16:1:1:2 Phosphoric, Acetic, Nitric and the manufacturer recommends heating to 40°C for etch then rinse. If you wish to remove the freckles Fujifilm provides a Freckle etch which we have in wet etch 2. The process is 1 min. at room T, rinse.

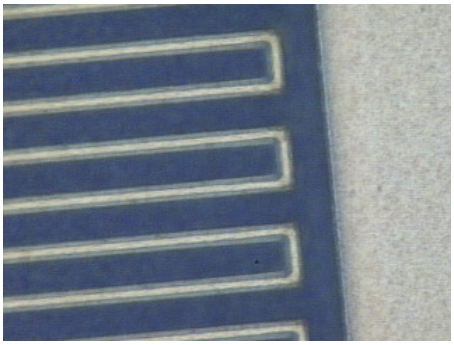


Picture at 50X after aluminum, freckles

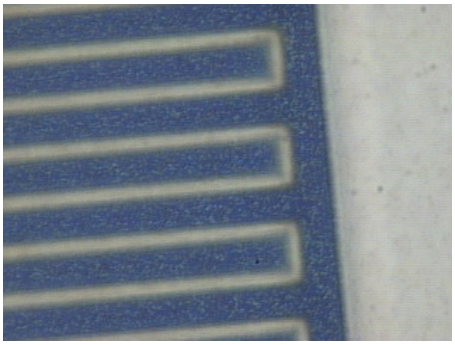


Picture at 50X after Freckle etch

The pictures below are at 100X. At 100X the depth of focus is very small and care must be taken to focus on the surface of the substrate not the surface of the aluminum to see freckles.

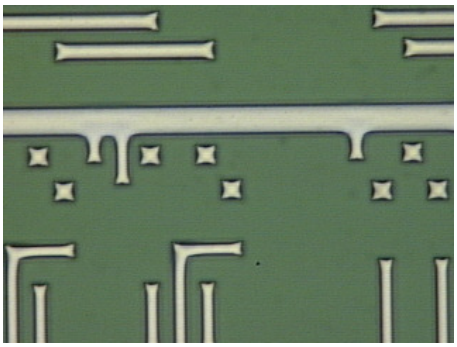


Focus at surface of Al

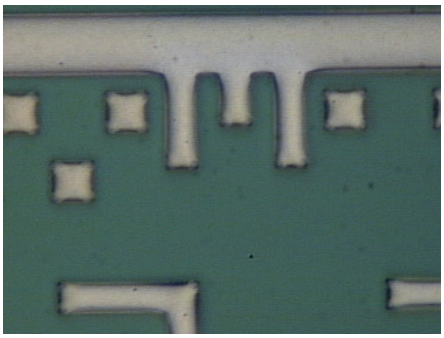


Focus at surface of wafer

Aluminum Etch Hot Pot set at 50 °C: We did another aluminum wet etch at a higher temperature and found no freckles.

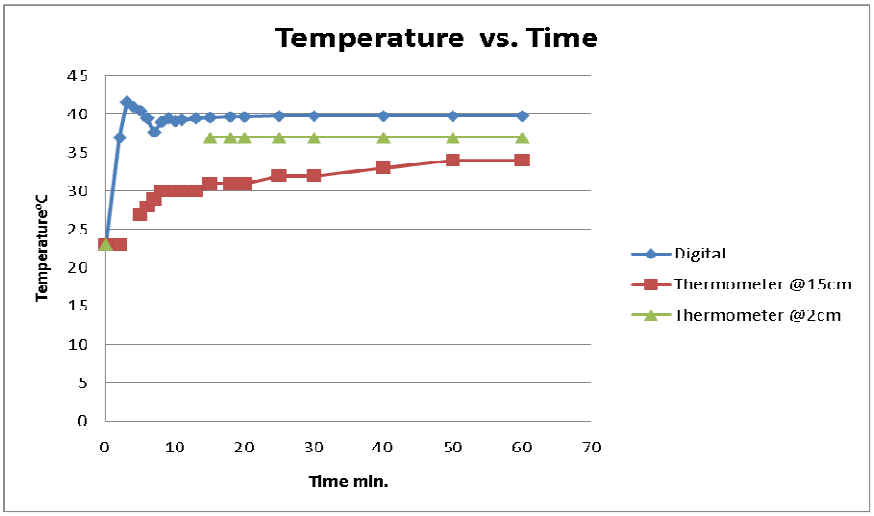


At 50X after 50C etch



At 100X after 50C etch

What is the real aluminum etch temperature with the Hot Pot set at 40 °C: Since the temperature at which the aluminum etch is done seems to be important with respect to leaving freckles or not, we decided to look closely at the temperature of the aluminum etch. We took data using the Digital temperature readout and using a thermometer held in the etch bath.



This shows that at the set point of 40 C the digital readout is not very accurate compared to the actual temperature where the center of your wafers are (Red). At a set point of 40 C it takes one hour to reach 35 C. It will never reach 40 C. I think that if you etch below ~30 C you will see freckles. If you etch at 35 C or higher you will not see freckles. I suggest changing the setpoint to 50 °C (which means etching at ~45 °C if you wait 15 min. for warm up. The etch rate depends on the bath temperature so the etch rate will be a little higher and the top of the wafer will etch faster than the bottom of the wafer. The etch rate is ~6000 A/min.

Bruce Furnace, LPCVD, Ion Implanter:

A new procedure is now in place for these tools. At the end of the day the keys to enable the Hydrogen for the Bruce Furnaces and the keys for the LPCVD and ion implanter are locked up

in line maintenance. The first user for these tools each day is expected to get the keys and place them in the lab and enable the hydrogen for the Bruce Furnaces.

To enable the hydrogen for the Bruce Furnace (flip on the gas enable…..the light will come on).

Lithography:

ASML PM on August 27 and 28th … the tool will not be available to use. Also there is no more 620-10 photoresist available except what is in a few small 125 ml bottles in solvent storage. I believe more has been ordered but I think there may be a two or three week delivery delay. We may be able to pump some resist into the small bottles when Bruce Tolleson returns from vacation.