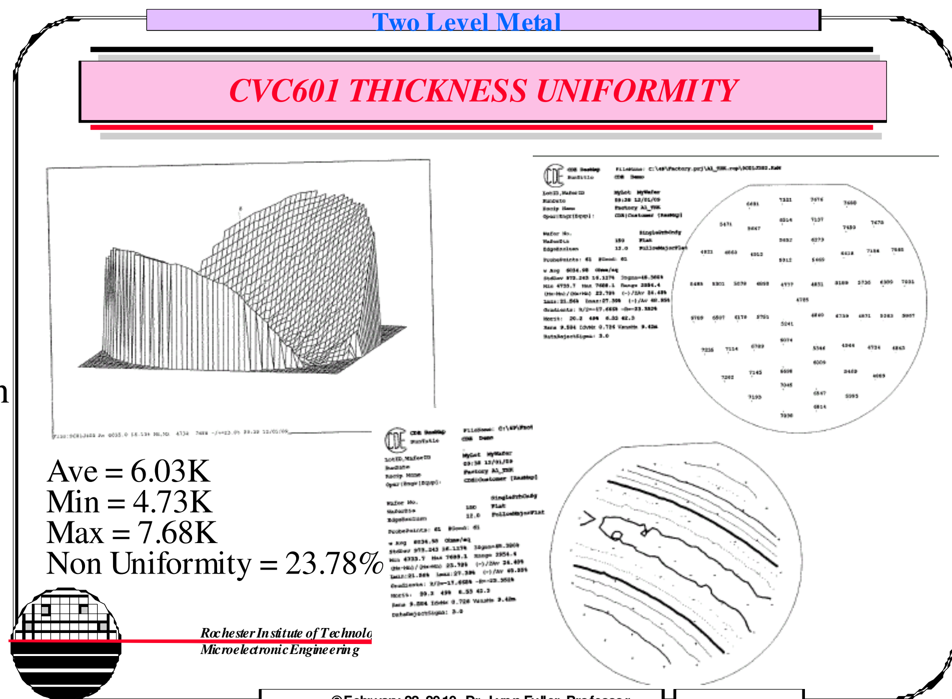
To: MicroE Faculty and Other Users of the SMFL
Date: 25 July 2013
From: Dr. Lynn Fuller webpage: http://www.people.rit.edu/lffeee

SMFL Users News Letter – Number 130725 Rev.1

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.

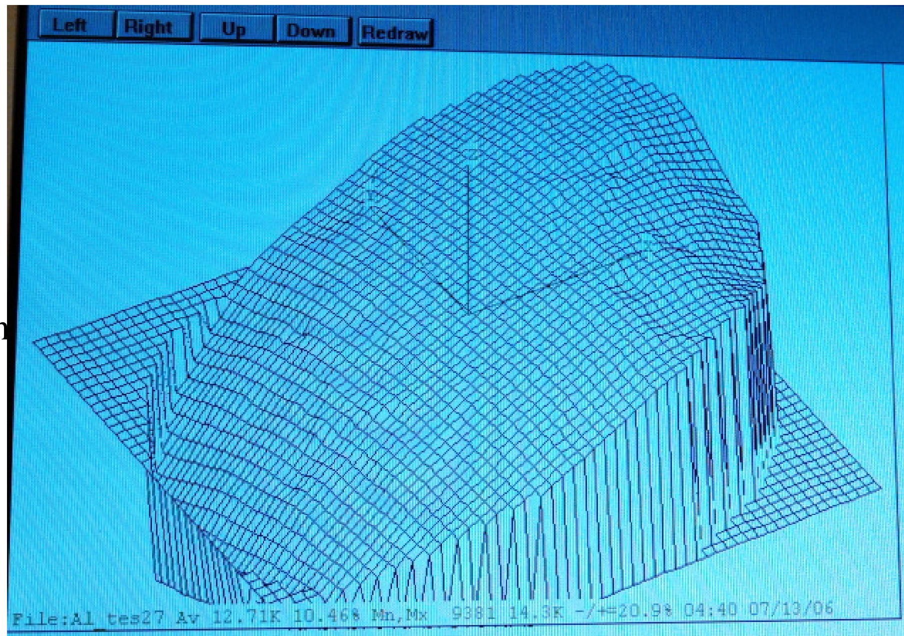
CVC 601 Sputtering:
There are metal shields over the Al/Si target are suppose to improve the film thickness uniformity by partially blocking the deposition on some areas of the wafers. For many years the shields have been in a given location and when they were removed for cleaning were replaced in approximately the same location. I have measured the thickness of deposited All/Si on six inch oxidized wafers using the 4-point probe CDE resistivity mapper in a mode where the I-V data is converted to thickness. (For more details on this technique see my document on Two_Level_Metal.pdf on my webpage) The 3-D plot of the thickness data is shown below.

Dep Rate = ~300Å/min



At the beginning of this summer the shields were removed for cleaning but it was found that they needed to be replaced and as a result in June and July the CVC 601 has had no shields installed over the Al/Si target. The result is that the deposition rate is higher 500Å/min compared to 300Å/min and the uniformity and 3-D plot are different. I collected new data on 23 July 2013. The 3-D plot is show below.

Ave = 12.7KÅ
Max = 14.3KÅ
Min = 9.38KÅ
Non Uniformity =
20.9%
Dep Rate = 500Å/min



Both of these depositions were done under the same conditions. 2000 watts, 25 min, 28 sccm and 5 mTorr. The 3-D shape is quite different, the average thickness is higher, The deposition rate is ~500 Å/min and the non uniformity is lower, 20% compared to 32%. So we can conclude that the deposition with no shields is better than with shields as located previously. I have done similar studies on other sputter and evaporation tools and found non-uniformity of 16% for the PE-4400 and less than 7% for the evaporators.

A decision needs to be made concerning the shields for the CVC601. First, are they going to be replaced, Second, will someone take the time to try to position them to improve the non uniformity (at least better than the 20% available with no shields). Finally, the new deposition rate (and other data) needs to be determined and made available to the users so we can update our process documentation.

Lithography:

As many of you know there have been many changes in the lithography area. Some of the changes include the SVG track is now 6-inch, we can no longer get ORI620M-10 (not made any more) photoresist and a new resist has been selected ORI620-10, the coat programs used on the SSI track for the old resist do not work for the new resist, the resist pump on the SSI has been removed and we have been hand dispensing resist on the SSI for several months now (a new pump has been purchased but has not been installed yet). I have not been able to get any technical information on the new resist and I do not know why it behaves differently from the old resist. The coat recipe COAT.RCP used on the SSI track has been modified to work with the new resist and hand coating. None of the other recipes have been fixed, no document has been made available that has the details for the recommended changes. I understand that the new resist coatings require a 30 second 2000 rpm spin to prevent striations in the resist coating after spinning at the normal higher RPM to give the desired resist thickness. Also the old

recipes need to turn off the resist dispense since the old pump has been removed and the lines filled with solvent, otherwise solvent will drip on your photoresist and ruin the coating.

The Gas-sonics photoresist asher lost its computer memory and all the information in memory was lost. The operating system and other system data has been reprogrammed and the recipe "1" has been recreated. All of the other recipes were lost. There could have been up to 15 different recipes stored in the tool. In the past the CMOS factory used recipe "F", which is a more aggressive ash to be used after high dose implants, and chlorine plasma etches. The "F" recipe was recreated recently. This is good because the CMOS MESA documentation refers to recipe "F" when needed. There is no documentation on how to create recipes in the SMFL operator's manual for the Gas-sonics. If you had special ash recipes and you want to recreate them I suggest that you contact Bruce Tolleson.

Wet Etch and Clean:

The 5.2 to 1 BOE etch tank has been drained. There is no BOE that has an etch rate over 1000Å/min. available in the SMFL. None has been ordered. I don't know if anyone plans to order it. For the faculty teaching the 4 sections of 601 this Fall (Hirschman, Pearson, Puchades) you need this BOE otherwise you need to change all of the existing Metal Gate PMOS documentation and you need to prepare for much longer oxide etches during lab.