Resistive Heater

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The process illustrates is for fabricating a heater on top of oxide layer, grown on silicon wafer. The heater is comprised of 10-20 nm of an adhesion layer, and 200 nm of Platinum (more expensive than other choices). The heater line is 5 microns thick, and spacing between the two lines is 5 microns.

> *1. LOR spinning*
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> > *a) Dry the wafer by baking on a hot plate at 180 C for at least five minutes. More time may help for smaller features, but 2-5 um heaters are okay at five minutes. Do not use any primers.*
> > *b) Clean wafer backside.*
> > *c) Spin coat with LOR 5A at 2500 rpm for 45 s, with acceleration 10,000 rpm/s. Dispense as much as you can on the wafer. Desired LOR thickness is 600 nm. To achieve better uniformity cut the narrow pipette tip off with a razor blade so only the large wide portion is used. This will allow much faster LOR dispensing so that the program can be started faster and less nonuniformity will result as the LOR has less time for surface adhesion to begin.*
> > *d) Bake at 170-210 C for around 3:30-5 min, 180 C is the best starting point (read chemical sheet for specific recommendations if going outside of 180 C).*
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> *2. UV210 spinning using Gamma Automatic Coat-Develop Tool, recipe #1003*
> *3. Expose using ASML using Energy 30 mJ/cm^2, and Focus 0*
> *4. Post exposure bake and develop using Gamma Automatic Coat-Develop Tool, recipe #2010 (or hot plates and hamatechs). This is a single puddle developing with MIF726 for 60 s. More developing will also cause more undercut, especially in DS-K101.*
> *5. Descum using Oxford 80 or the Anatech.*
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> > *a) Oxygen plasma cleaning for empty chamber for 10 min*
> > *b) Descum with Oxygen plasma for 30 s. The descum rate is about 150-200 nm/min. Up to 2-3 min can be used for thicker metal and LOR.*
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> *6. Metal evaporation using SC4500 Evaporator*
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> > *a) Deposition of 10-30 nm of an adhesion layer, Ti and Cr are the most common but users have reported success with Ta. Ti and Cr tend to have stronger adhesion and are more standard adhesion layers for Al, Pt, Ni, etc. To test adhesion on a dummy heater wafer, users can put scotch tape on the heater and pull off and the heater should remain on the wafer. To test for bonding quality adhesion (stronger than scotch tape test), use the wire bonder on the second floor. For example, Al without Cr adhesion survives the scotch tape test but not the wire bonding test.*
> > *b) Deposition of 210 nm of Pt. Keep in mind the NBTC evaporator Pt costs 60 cents/A and CNF evaporation costs 8 cents/A when choosing tools.*
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> *7. Lift-off bath at 1165 overnight. The wafers were put in a holder like the wafer boat (shown in attached image), facing down. Users have reported that turning the wafer upside down accelerates the liftoff process. Using a pipette to squeeze 1165 in and out to make currents will also greatly accelerate the process. Spin-rinse-dry after taking the device out of 1165.*
> *8. If coating oxide cladding over the electronics, it is important to bake at least 5-10 min above around 115 C to evaporate out the 1165 /water in the SiO2 under the metal. SiO2 is well-documented in literature to be like a sponge with fast absorbance and users have witnessed the “boiling” of the remnant liquid significantly worsened adhesion of metals (peeling off or discoloration) in high temperature PECVD processes that stopped occurring when a prebake was done.*
> *9. Test at least a few heaters in the IV probe station to make sure they are the proper resistance.*