

## **POLYIMIDE HD4100 Lithography**

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### **1. Clean**

Always start with clean silicon (or silicon dioxide) wafers. Unclean wafers can lead to bubbles.

### **2. Pre-spin bake**

150C hot plate for ~3 minutes (to remove any moisture from the surface, which can cause bubbles).

### **3. Spin on polyimide**

- a. Put the wafer onto the vacuum chuck of the spinner and get it centered and all ready.
- b. Manually pour the polyimide onto the wafer from the bottle. Get a good solid blob on, but pour very carefully to avoid any bubbles.
- c. (optional) You can spin the wafer at a super low speed like 100 or 200 rpm for a few seconds just to get the polyimide to spread out. If the blob you have poured is big enough, there is no need for this step and just let the blob spread out on its own.
- d. Then wait at least 10 minutes while the polyimide slowly spreads out. This is a very important step in making sure that any small bubbles that might have been introduced during pouring have time to evaporate. Do not skip this step, no matter how much of a hurry you're in. Even better is vacuuming the PI.
- e. Finally spin the polyimide. For 6-10 um features (post-curing): spin at 1000 rpm for 25 seconds (with a 200 rpm/s ramp) to get the polyimide to spread out nicely, and then spin at 2000-3000 rpm (depending on how thick you want the final layer to be) for 60 seconds (with a 500 rpm/s ramp).
- f. Let the wafer rest for at least a couple minutes.

### **4. Post-spin bake**

90 C hot plate for 3 mins and then a 120 C hot plate for 3min.

### **5. Expose**

- a. Interval exposure recommended, soft contact. Typical exposure settings are 6 cycles of (5 second exposure followed by 8 second delay).
- b. Let the wafer rest for 5 mins
- c. Post-exposure bake: 80C for 60 seconds.

### **6. Develop**

Spray-Puddle recommended. First with PA 400 D, the second I fill with 50:50 PA400D:SU8 Developer, and the third with pure SU8 Developer. Time and process saved in the spin coater ("**Spray-Puddle MARIA**").

### **7. Check under microscope**

Check under a microscope to make sure the wafer is developed. If not, put it through a short develop cycle.

### **8. Post-develop bake**

150C hot plate for 2 mins followed by a 200 C hot plate for another 2 mins. This removes the unnecessary volatiles from the developing step.

### **9. Cure**

For a partial cure (for the 1st polyimide layer), put the wafers on the hot plate in the glove-box and ramp the temperature up to 300 C and hold for 30 mins (while flowing nitrogen), then cool down.

For a full cure (2<sup>nd</sup> layer of polyimide), put the wafers on the hot plate in the glove-box (with nitrogen flow) and ramp the temp up to 200 C and hold for 30 mins, then ramp the temperature up to 350 to 375 C and hold for 1 hour. Then cool back down.

After curing, the wafers should have nice brown color like Kapton tape. If the color is too dark and the polyimide film looks "brittle", then you probably burnt it a little bit and you can go to a lower cure temperature next time. If the color is too transparent and not brown enough, you might not have gone high enough with the temperature. Under-cured films will not be as resistant to chemicals etc., and over-cured films will be a little brittle, so you'll want to find the right cure temperature for ideal device properties.