

PZT Tube Electrodes KLZ 16/0256

PROJECT NUMBER: 12422 (HYAZINT)

CLEANROOM START: 2016.05.12

CLEANROOM END: 2016.05.26

Short description of the fabricated chips:

SUBSTRATES:

- (6+6) x Silicon, Prime Single Side Polished, 100 mm diam , 525 um thickness.

STRUCTURES:

- 2x3 Wafers: Polyimide electrodes (PI-Platinum-PI), 3 variations, 2 copies each.
- 6 Wafers: Spin coating and curing of Polyimide (5 um). To be stored.

MASK SET:

- 10 "U ELECTRODES"
 - 0 "METAL"
 - 1 "POLYIMIDE"
- 20 "ZIP ELECTRODES"
 - 0 "METAL"
 - 1 "POLYIMIDE"
- 30 "ROLL ELECTRODES"
 - 0 "METAL"
 - 1 "POLYIMIDE"

Process		Comments
1. <u>Spin-coating of polyimide</u>	<input type="checkbox"/>	Always check vacuum is working!
<ul style="list-style-type: none"> • Targeted thickness: 5 µm • Statically dispense 2 ml of U-Varnish S • 3000 rpm, 30 s 		Coated 12 wafers: 6 with minor defects, stored: Bubbles, streaks, "orange skin"
2. <u>Softbake:</u>	<input type="checkbox"/>	Continued processing the best 6 wafers
<ul style="list-style-type: none"> • Hotplate for 3 min @ 120 °C 		
3. <u>Curing in N2 Atmosphere:</u>	<input type="checkbox"/>	
<ul style="list-style-type: none"> • Oven Program 3: 10 min @ 450 °C • (Whole temperature ramping process time: approx. 3.5 hours) 		

Process

Comments

4. HMDS-priming: ☐

- Oven approx. 15min.
- (Or on the HDMS hotplate (Program 1))

5. **Spin Coating of negative resist:** ☐

- Statically dispense **2.0ml** of **Ma-N 1420**
- **4000 rpm, 30 sec**

6. **Softbake:** ☐

- **100°C, 120 s**

7. **Exposure: "0 METAL"** ☐

- Bright field mask, flat alignment, foil mask, soft contact
- Alignment gap: 130 μm
- WEC Offset: 0
- **60 sec @ 9mW** (i.e. > normal exp. dose).

- ## 8. Develop ☐

- **Ma-D 533/S: ~~01:45-01:55 min~~ 2m 20s**
- In Petri dish (static)
- Rinse, spin dry

After 1m50s underetching was too small. Added 30 s.

9. **O2-flash** (Improve adhesion of Platinum) ☐

- **TePla (Barrel):** Prog. **“O2-flash”** 2 min @ 80 W

- ## 10. DC-sputtering of Platinum ☐

- Leybold UNIVEX 500
- Target film thickness: **100 nm**
- **400 Watt – 2 x 50 sec** – wait interval: > 20 min!

One of the u-electrodes wafer not ideal:
Shutter was only half opened

11. **LIFT-OFF** Platinum (overnight): ☐

- DMSO (coarse then fine)

Process	Comments
<ul style="list-style-type: none"> If needed, heat to 70 degC Rinse, spin dry 	
12. <u>Optical inspection</u> <input type="checkbox"/>	<ul style="list-style-type: none"> Pt thickness: 90-120 um
13. <u>Measure Pt film thickness with profilometer</u> <input type="checkbox"/>	<ul style="list-style-type: none"> Lines: 55-57 um
14. <u>O2-flash (Improve adhesion of 2nd polyimide layer)</u> <input type="checkbox"/>	<ul style="list-style-type: none"> Spacing: 42 um
<ul style="list-style-type: none"> TePla (Barrel): Prog. "O2-flash" 2 min @ 80 W 	<ul style="list-style-type: none"> Overall good looking
15. <u>Spin-coating of polyimide</u> <input type="checkbox"/>	
<ul style="list-style-type: none"> Targeted thickness: 5 µm Statically dispense 2.5 ml of U-Varnish S Note: Use more PI as on a virgin Si-Wafer! 3000 rpm, 30 s 	
16. <u>Softbake</u> <input type="checkbox"/>	
<ul style="list-style-type: none"> Hotplate for 3 min @ 120 °C 	
17. <u>Curing in N2 Atmosphere</u> <input type="checkbox"/>	
<ul style="list-style-type: none"> Oven Program 3: 10 min @ 450 °C (Whole temperature ramping process time: approx. 3.5 hours) 	

18. <u>HMDS-priming</u> <input type="checkbox"/>	
<ul style="list-style-type: none"> Oven approx. 15min (Or on the HDMS hotplate (Program 1)) 	
19. <u>Double Spin coating of positive photoresist</u> <input type="checkbox"/>	
<ul style="list-style-type: none"> Targeted thickness: $t \approx 26 \mu\text{m}$ Statically dispense 2.5 ml of AZ 9260 1st layer: 1600 rpm for 30s ($t_a = 1000\text{ms}$) Let wafer sit on the pins of the hotplate for 3 m Softbake: hotplate 14 min @ 100°C 2nd layer: 1600 rpm for 30s ($t_a = 1000\text{ms}$) 	

Process	Comments
<ul style="list-style-type: none"> Let wafer sit on the pins of the hotplate for 3 m Softbake: hotplate 14 min @ 100°C 	
20. <u>Softbake</u> <input type="checkbox"/>	
<ul style="list-style-type: none"> Hotplate for 3 min @ 100°C 	
21. <u>Rehydration in wet chemistry room</u> <input type="checkbox"/>	
<ul style="list-style-type: none"> > 3 hrs @ 60% humidity 	

22. <u>Multi-Exposure: "1 POLYIMIDE"</u> <input type="checkbox"/>	Always use factor x1.5 if using foil masks!
<ul style="list-style-type: none"> Bright field mask, soft exposure: 5 x 15 sec @ 9mW, 50 sec wait intervals (If bubbles appear reduce the exposure dose) 	Exposed with 5x10 sec followed by flood exposure 2x3.5s, 50s wait + 0.5s
23. <u>Development</u> <input type="checkbox"/>	Residual resist thickness > 20 um
<ul style="list-style-type: none"> Spray developer, Program L (2 times) (optional: Immersion development: AZ400K:H2O = 1:3 – aprx. 3 min) 	
24. <u>RIE: "Harsh" O2-plasma etch,</u> <input type="checkbox"/>	Wafer in position 3 accidentally etched twice!
<ul style="list-style-type: none"> Recipe 09001_2: 30 mTorr, 50 sccm O₂: <ul style="list-style-type: none"> 15 min @ 120 W (Displ 200 W) 20 min @ 60 W (Displ 100 W) Optical inspection: Otherwise further etching! Testing conductivity with multimeter (if contact etching is sufficient) 	Added additional 5 minutes to etch through completely.
25. <u>Resist stripping III:</u> <input type="checkbox"/>	
<ul style="list-style-type: none"> ACE coarse, ACE fine, ISO, rinse, spin dry 	
26. <u>Profilometer:</u> <input type="checkbox"/>	
<ul style="list-style-type: none"> Measure Polyimide film thickness 	
27. <u>Optical microscope inspection:</u> <input type="checkbox"/>	