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S1811 Liftoff

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Summary:
This document describes a basic lift off procedure with S1811 photoresist.

Table of content

1	Associated Documents & References	1
2	Equipment Used	1
3	Verifications Prior to Processing	1
4	Recipe description	2
5	Technical Data	2
6	Measurements & Statistical Process Control	2
7	Record of Revisions	3

1 Associated Documents & References

MSDS of chemicals involved.
Spinner Standard Operating Procedure
Mask Aligner standard operating procedure
E-beam evaporator Standard Operating Procedure
Rules and procedures of cleanroom

2 Equipment Used

Wet bench, mask aligner in Bahen Cleanroom 7175A, e-beam evaporator in Room 7175.

If you need to be assisted by the technician, check availability with him before reserving the equipment. Users have to go through regular training before using this equipment alone.

3 Verifications Prior to Processing

Vacuum pump for spinner is turned on.



Laurell spin coater is clean.
Photoresist is not old.

4 Recipe description

Lift-off of very thin, tens of nanometers, metal

1. spin P-20, 5000 rpm, 90 s
2. spin s1811, 5000 rpm, 90 s
 - the spin speed is not absolute, follow the photoresist thickness tuning curve to suit individual needs
3. soft-bake on hotplate, 100 °C, 90 s
4. expose using mask aligner, 5 s, soft mode, mask distance: 33 μm
 - exposure time is depended on photoresist thickness spun in step 2
5. develop, $\sim 60 - 90$ s
 - check under an optical microscope to ensure complete removal of the exposed photoresist.
 - make sure the UV filter is placed in the microscope to prevent unwanted exposure
6. rinse under DI water, ~ 60 s
7. N₂ air drying of the sample
8. bake on hotplate, 60 °C for 30 min
 - this step may be required if metal evaporation affects the resist.
9. evaporate silver
 - evaporation rate is usually set to 0.3 nm/s
10. immerse in acetone
 - usually, the photoresist should peel off in the first 10 minutes. If not, alternate ultrasonic bath and acetone soaking at 10-minute intervals. Leave the samples in acetone over night if needed.

(This protocol is generated by Michelle Xu, who is from Prof. Aitchison's group at ECE department. Using this protocol, Michelle has been able to fabricate 20 nm thick, 1 μm wide, silver parallel waveguide arrays that has 2 μm center-to-center separation.)

5 Technical Data

Cleanroom at 22 ± 1 C, 45 ± 5 % RH
Suss MA6: 16 mW/cm² at 365 nm, 32 mW/cm² at 405 nm

1. Too thick photoresist shadows the deposition down deep in the trench 2. Not enough overhang on the photoresist will make a continuous metal film on the photoresist sides 3. A tail on one side of the metal deposited at the bottom of the trench 4. Measure the roughness and slope on the metal after liftoff.

6 Measurements & Statistical Process Control



7 Record of Revisions

Rev. 0
Rev. 1

July 8
August 1, M. Xu