

SAMPLE FABRICATION LOG

Sample name: Rings_11

Date of start: 18.9.2019

Date of completion: 16.01.2020

Substrate: (4" wafer patterned as in Step I - cut to 10 x 10 mm² chips)

Material: prime FZ Si - undoped, 2 side polished

Orientation: 100

Resistivity [Ω cm]: 10k - 1000k

Thickness [μ m]: 252 \pm 10

Ordered from MicroChemicals (Art. # WFA40525100X1719SNN1)

Step 1: large parts of CPW and DC antennas (CPW 50-100um plus 4DC - all turned)

	Process step	Date	Ini- tials	Sig.	Remarks
Resist	spin LOL 2000 30s at 4000 rpm bake 5 min at 140°C	16.08.2018	KS	KS _f β	
Resist	spin S1813 30s at 4000 rpm bake 2 min at 115°C	16.08.2018	KS	KS _f β	
Litho- graphy	MA6 soft contact, 3 sec exposure, mask: CPW+2DC	16.08.2018	KS	KS _f β	
Develop- ment	10 sec MF319	16.08.2018	KS	KS _f β	
Depo-sition	5 nm Ti / 50 nm Au	21.08.2018	BS		
Lift off	remover 1165 at 60°C (ultrasonic only after at least 10 min, best even in fresh remover)	23.08.2018	KS	KS _f β	
4" wafer cut to 10 x 10 mm² chips - handled by Frau Schnabel - now available in clean room					

Step 2: small parts of CPW and DC antennas

	Process step	Date	Ini- tials	Sig.	Remarks
Resist	EL 11 spun 60s at 3000 rpm, with gyrset bake 5 min at 180°C → ~310 nm thick	18.9.19	KS	KS _β	
Resist	950 PMMA A4 spun 60s at 3000 rpm, with gyrset bake 5 min at 180°C → ~150 nm thick	18.9.19	KS	KS _β	
EBL	machine: <u>RauH 150</u> design: <u>GDSII (Rings)</u> <u>Rings 10+ step1 antennas gds</u> layers: <u>4,61</u> aperture: 10 kV, 20 µm, 10 mm; beam current: <u>93.08</u> pA; writefield size: 200 µm; area+curved step size: 10 nm; area+curved dose: 100 µC/cm² → <u>9.3</u> mm/s	7.10.19	KS	KS _β	
Develop- ment	30 sec IPA:DI (3:7) stopper 30 sec IPA	7.10.19	KS	KS _β	
Quality check	<u>optical microscope</u>	7.10.19	KS	KS _β	antennas exposed properly BUT: I forgot to recalculate exposure parameter for sample name → write again with ! magnetic layer
Depo- sition	5 nm Cr / 100 nm <u>65 nm</u> Au	28.10.19		<u>Viktor.</u>	
Lift off	acetone <u>1165 @ 60°C</u> (with/without ultrasonic/pipette)	11.11.19	KS	KS _β	
Quality check	<u>optical microscope</u>	12.11.19	KS	KS _β	all antennas lifted nicely!

CAREFUL:
Sample lies top down
in sample box!!!

~~Step 2: HSQ insulation~~

	Process step	Date	Ini- tials	Sig.	Remarks
Resist	pre-bake 2 min at 120° C HSQ 6% spun 30 s at 3000 rpm; post-bake 2 min at 120° C → 150 nm				
EBL	machine: design: layers: aperture: 20 kV, 120 µm, 10 mm; beam current: _____ pA; writefield size: 100 µm; area+curved step size: 10 nm; area+curved dose: 750 µC/cm² → _____ mm/s beam speed				
Develop- ment	30 s in DI-H₂O+20g NaCl+5g NaOH rinse 1 min with DI water				
Quality check					

no insulation layer patterned for this sample

Step 4: magnetic structures

	Process step	Date	Ini- tials	Sig.	Remarks
Resist	950 PMMA A6 ⁶ spun 60s at 3000 rpm, with gyrset bake 5 min at 180°C → <u>3</u> 50 nm thick	18.11.19	KS	KS _β	
EBL	machine: <u>Raith 150</u> design: <u>GDSII / Rings 1</u> <u>Rings - 10x - step 2 - Py .cst</u> layers: <u>1,61</u> aperture: 10 kV, 10 µm, 10 mm; beam current: <u>14.74</u> pA; writefield size: 100 µm; area+curved step size: 10 nm; area+curved dose: 100 µC/cm² → <u>1.47</u> mm/s beam speed	4.12.19	KS	KS _β	
Develop- ment	30 sec MBK IPA:DI (<u>3:7</u>) stopper <u>30</u> sec IPA	5.12.19	KS	KS _β	
Quality check	—	—	—	—	
Depo- sition	5 nm Cr / 50 nm Ni ₂₀ Fe ₈₀ / 5 nm Cr	6.12.19		Velen.	
Lift off	acetone (with/without ultrasonic/pipette)	16.1.20	KS	KS _β	
Quality check	<u>SEM</u>	17.1.20	KS	KS _β	unfortunately, for the 2µm φ neither the 200 nm n or the 400 nm holes worked. for the 1µm φ, the 100 nm, 200 nm φ 400 nm didn't work

SAMPLE OVERVIEW

Sample name: Rings_11

Substrate:

prime FZ Si, 100, undoped, 2 side polished, 10-1000 kΩcm resistivity

Magnetic Material:

5 nm Cr / 50 nm Ni₂₀Fe₈₀ /
5 nm Cr

Insulation:

Antennas:

Large parts: 5 nm Ti / 50 nm Au

Small parts: 5 nm Cr / 100 nm Au

Structure status:

Please cross out dead structures in the table below.

	1	2	3	4	5
I					
H					
G					
F	X	X	X	X	X
E					
D					
C					
B					
A					