



IIT Bombay Nanofabrication Facility

IITBNF – Equipment Performance

Equipment	Location	Ambience	Contamination category
Voyager	Nano 2 lab	Class 1000	Litho / Analytical

Base Line Recipe Monitoring Methodology:

1. Base line recipe of Voyager will be executed on Si samples of size ~1cm X 1cm once in a month with **single layer- PMMA 950K A 4 and single layer PMMA 950K A8**
2. Grating lines patterns with minimum separation of 100 nm and line width 50 nm is used for **single layer- PMMA 950 A 4** and Grating lines patterns with minimum separation of 200 nm and line width 200 nm is used for **single layer- PMMA 950 A 8**

(Detail recipes are given on the next pages)

3. Minimum Resolution achieved is checked and measured by inspecting the sample in Raith-SEM after metal lift-off. Measurement is done for different doses as mentioned in the detail recipes in the next pages
4. Minimum features achieved and the corresponding dose is plotted in two different graphs with respect to the baseline date for both **PMMA 950 A4 and PMMA 950 A 8**
5. **Beam current** is measured for the particular **column mode (@ 50KV)** and is plotted with respect to the baseline date.

Voyager Baseline Recipes

PMMA single layer- PMMA 950 A 4

Resist	PMMA 950K A4	Dehydration bake	~5 Min @ 180 °C
Spin Recipe	5 sec@500rpm 59 sec@4000rpm 5 sec @0rpm	Post-Bake	~ 2min @ 180 °C Let it cool down for 2mins
Exposure	Voltage-50KV, Aperture-40um, Column Mode: 40um	Development	MIBK: IPA: 1:3 – 25sec IPA rinse – 30 sec
Dose: 475uC/cm2	Feature achieved: 100nm line with 200nm separations	Dose: 525uC/cm2	Feature achieved: 50nm line with 100nm separations
Dose: 550uC/cm2	Feature achieved: Single Pixel line with 500nm separations, SPL width ~36-40nm		

Sample preparation:

1. Sample size: 1cm x 1cm
2. Clean with Acetone/IPA (Sonicate) 5 min
3. Dehydrate at 180 °C for 5 min, let it cool down for 2 mins
4. Spin Time: 59sec, rpm: 4000, Acceleration: 2000
5. Bake at 180 °C for 2 mins
6. Writing Parameters: -
 - EHT: 50 KV
 - Column Mode: Low current
 - Aperture: 40 um
 - Write field: 500 um (Conventional)
 - Doses- **475, 525, 550** uC/cm2,
 - Step Size- 2 nm
 - Beam Current on faraday Cup: 0.14805nA (148.41pA)
 - Writing

- Development time:
MIBK: IPA (1:3): 25 sec
IPA (Stopper): 30 sec
- Descum: 2mins (low power < 20 W)
- Metallization: Ti/Au: 5/50 nm (done on 6TEBE)
- Liftoff: Sample kept in PG Remover at 70°C for overnight (30-36 hrs)

PMMA 950K A8

Resist	PMMA950K 8%	Dehydration bake	~5 Min @ 180 °C
Spin Recipe	5 sec@500rpm 75 sec@3000rpm 5 sec @0rpm	Post-Bake	~ 5min @ 180 °C Let it cool down for 2sec
Spin Recipe for Conducting Polymer ARPC 5090	5 sec@500rpm 45 sec@3000rpm 5 sec @0rpm	Post-Bake	~3mins at 105 °C
Exposure	Voltage-50KV, Aperture-40um,	Development	Dip in DI water for 1min Rinse with DI water MIBK: IPA (1:3): 5mins IPA: 30sec
Dose: 400uC/cm2	Feature achieved: 200nm line with 200nm separations		

Sample preparation:

1. Sample size: 1cm x 1cm
2. Clean with Acetone/IPA (Sonicate) 1min
3. Dehydrate at 180°C 5 min, let it cool down for 2 mins
4. Spin **PMMA 950K A8**:
Time: 75sec, rpm: 3000, Acceleration: 1500
5. Bake at 180°C for 5 mins
6. Spin **Conducting Polymer: ARPC 5090**
Time: 45sec, rpm: 3000, Acceleration: 1500

7. Bake at 105°C for 3 mins

. Writing Parameters: -

- EHT: 50 KV
- Column Mode: Low current
- Aperture: 40 μm
- Write field: 500 μm (Conventional)
- Doses- **380, 400, 420** $\mu\text{C}/\text{cm}^2$
- Step Size- 2 nm
- Beam Current on faraday Cup: 0.15329nA (153.29pA)
- Writing
- Development:
 - ❖ Dip in DI water for 1min
 - ❖ Rinse with DI water
 - ❖ MIBK: IPA (1:3): 5mins
 - ❖ IPA: 30sec
- Descum: 2mins (low power < 20 W)
- Metallization: Ti/Au: 10/300 nm (done on 6TEBE)
- Liftoff: Sample kept in PG Remover at 70°C for overnight (30-36 hrs)