BATCH MANUFACTURING RECORD

STM Hydrogen Desorption Lithography Process

Batch Number:	_____	**Date Started:**	_____
Device ID:	_____	**Target Completion:**	_____
Sample:	_____	**Actual Completion:**	_____
Primary Operator:	_____	**QC Review:**	_____

Step 1: Ex Situ — New Sample Mounting

Operator Initials: _____ **Start Time:** 2025-11-11 12:48 **End Time:** 2025-11-11 14:03

Parameter	Value
Sample Plate Id	G
Substrate Id	W200306B10U3
Substrate Dopant	B
Substrate Resistivity Ohmcm	3-10
Substrate Thickness Um	300 um
Sample Alias	Kingsbury
Sample Id	S20240419BMG
Mount Resistance Kohm	_____
Notes	_____

Quality Checks:

Check	Pass	Fail	N/A
Sample secured	[x]	[ ]	[ ]
Contacts intact	[x]	[ ]	[ ]
Plate ID matches log	[x]	[ ]	[ ]

Notes / Observations:

Completed by:	_____	**Date/Time:**	2025-11-11 14:03
Verified by:	_____	**Date/Time:**	_____

Step 2: Degassing

Operator Initials:	_____	**Start Time:**	2025-11-11 12:45	**End Time:**	2025-11-11 14:03

Parameter	Value
P Mbe Base Mbar	3.2E-10
Resistive Ramp Up Min	15
Resistive Peak Pressure Mbar	1.9E-9
Resistive Peak Current A	1.5
Resistive Peak Temperature C	450
Resistive Ramp Down Min	1
Direct Base Mbe Pressure Mbar	3.5E-10
Direct Ramp Up Min	5
Direct Peak Pressure Mbar	8E-10
Direct Peak Current A	0.5
Direct Peak Temperature C	600
Direct Ramp Down Min	0
File Name	20240419_OUTGAS.txt

Quality Checks:

Check	Pass	Fail	N/A
Target temperatures reached	[x]	[ ]	[ ]
Peak pressure within acceptable range	[x]	[ ]	[ ]

Notes / Observations:

Completed by:	_____	**Date/Time:**	2025-11-11 14:03
Verified by:	_____	**Date/Time:**	_____

Step 3: Flashing

Operator Initials:	_____	**Start Time:**	2025-11-11 12:45	**End Time:**	2025-11-11 14:03

Parameter	Value
Idle Temperature C	900
Idle Current A	2.4
Flash Temperature C	1201.0
Flash Current A	6.5
Cooldown Time Min	30
Number Of Flashes	9
File Name	20240423 Flash.txt

Flash Events (default 5 rows, max 10):

Flash #	Temperature (C)	Duration (s)	P_MBE (mbar)
1	1201	11	4.2E-9
2	1170	6	2.2E-9
3	1166	6	2.5E-9
4	1165	6	1.2E-9
5	1162	6	1.3E-9
6	1167	8	1.2E-9
7	1162	20	4.0E-9
8	1194	6	1.0E-9
9	1192	7	9.6E-10

Quality Checks:

Check	Pass	Fail	N/A
Flashes sufficient	[x]	[ ]	[ ]
No abnormal P spikes	[x]	[ ]	[ ]

Notes / Observations:

Completed by:	_____	**Date/Time:**	2025-11-11 14:03
Verified by:	_____	**Date/Time:**	_____

Step 4: Temperature Calibration (Cooldown analysis)

Operator Initials: _____	Start Time: 2025-11-11 12:57	End Time: 2025-11-11 14:03

Parameter	Value
Current At 335C A	0.040
Current At 350C A	0.074
Current At 470C A	0.140
Current At 250C A	0.027
Calibration File	C:/Users/kspruce/device_record/labview_data/S20240419BMG ('Kingsbury'
Calibration Notes	_____

Quality Checks:

Check	Pass	Fail	N/A
Calibration points verified	[x]	[ ]	[ ]
Matches prior runs	[x]	[ ]	[ ]

Notes / Observations:

Completed by: _____	Date/Time: 2025-11-11 14:03
Verified by: _____	Date/Time: _____

Step 5: Hydrogen Termination

Operator Initials:	_____	**Start Time:**	2025-11-11 12:45	**End Time:**	2025-11-11 14:03

Parameter	Value
Termination Current A	0.063
Termination Temperature C	360
Termination Pressure Mbar	5.34E-7
Peak Cracker Temperature C	1538
Peak Cracker Current A	11.36
File Name	20240423 HTERMINATE.txt

Termination Process (7 labeled rows):

Time [HH:MM]	Cracker I [A]	Cracker V [V]	Cracker T [C]	I_sample [A]	V_sample [V]	T_pyro [C]	T_TC [C]	P_MBE [mbar]	Notes
1047	0	0	20						
1047	0	0	21						
1055	11.36	10.56	1283						
1056	11.36	10.66	1396						
1109	11.36	10.76	1538						
1119	0	0	420						

Quality Checks:

Check	Pass	Fail	N/A
Cooling water on	[x]	[ ]	[ ]
Valves configured	[x]	[ ]	[ ]
P_MAX within spec	[x]	[ ]	[ ]
Uniform termination	[x]	[ ]	[ ]

Notes / Observations:

Completed by:	_____	**Date/Time:**	2025-11-11 14:03
Verified by:	_____	**Date/Time:**	_____

Step 6: Termination Check (STM)

Operator Initials: _____	Start Time: 2025-11-11 12:45	End Time: 2025-11-11 14:04

Parameter	Value
Scan Area Nm	100
Bias Voltage V	-2
Setpoint Current Pa	60
Scan Folder Location	_____
Scan Numbers Of Interest	_____
Coverage Assessment	_____
File Name	20240423 HTERMINATE.txt

Quality Checks:

Check	Pass	Fail	N/A
Uniform H coverage	[x]	[ ]	[ ]
No contamination	[x]	[ ]	[ ]

Notes / Observations:

Completed by: _____	Date/Time: 2025-11-11 14:04
Verified by: _____	Date/Time: _____

Step 7: STM HDL

Operator Initials:	_____	**Start Time:**	2025-11-11 13:14	**End Time:**	2025-11-11 14:04

Parameter	Value
Fem Voltage V	6.5
Fem Current Pa	1.5
Fem Speed	400
Apm Voltage V	3.5
Apm Current Pa	3.5
Apm Speed	50
Fem Pitch	3
Apm Pitch	1
Passes	_____
Total Path Length Nm	_____
File Name	_____

Notes / Observations:

Completed by:	_____	**Date/Time:**	2025-11-11 14:04
Verified by:	_____	**Date/Time:**	_____

Step 8: Dose (XH3)

Operator Initials:	_____	**Start Time:**	2025-11-11 12:45	**End Time:**	2025-11-11 14:04

Parameter	Value
Dopant Species	PH3
Target Dose Pressure Mbar	5E-9
Dose Duration S	600
Initial Pressure Mbar	2.65E-11
Mean Dose Pressure Mbar	4.23E-9
Baseline Pressure Mbar	2.65E-11

Exposure Langmuirs	2.59
Leak Valve Start Turns	2
Leak Valve Operating Turns	4.4
Dose Start Time	0924
Dose End Time	0934
File Name	C:/Users/kspruce/device_record/labview_data/S20240419BMG ('Kingsbury'
P Vt Channel Name	P_VT

Quality Checks:

Check	Pass	Fail	N/A
Tip retracted	[x]	[ ]	[ ]
Stage locked	[x]	[ ]	[ ]
Matrix controller off	[x]	[ ]	[ ]
Pressure stable (P_VT)	[x]	[ ]	[ ]

Notes / Observations:

Completed by:	_____	**Date/Time:**	2025-11-11 14:04
Verified by:	_____	**Date/Time:**	_____

Step 9: Incorporation

Operator Initials: _____	Start Time: 2025-11-11 12:45	End Time: 2025-11-11 14:04

Parameter	Value
Incorporation Temperature C	350
Incorporation Time S	120
Planned Current A	0.074
Actual Current A	0.067
Initial Pressure Mbar	2.98E-11
Max Pressure Mbar	3.4E-10
Incorporation Location	stage
File Name	_____

Quality Checks:

Check	Pass	Fail	N/A
350C ± 5C	[x]	[ ]	[ ]
2 min strict	[x]	[ ]	[ ]
Pressure acceptable (P_MBE)	[x]	[ ]	[ ]

Notes / Observations:

Completed by: _____	Date/Time: 2025-11-11 14:04
Verified by: _____	Date/Time: _____

Step 10: Overgrowth (LL + RTA + LTE)

Operator Initials: _____	Start Time: 2025-11-11 12:45	End Time: 2025-11-11 14:04

Parameter	Value
Total Overgrowth Nm	20
Total Growth Time S	1:31:28
Susi Calibration Rate Nm Min	1.6
Susi Calibration Current A	45

Susi Calibration Date	29/02/2024
Ll Time S	6:06
Ll Current A	0
Ll Temperature C	20
Rta Temperature C	470
Rta Time S	15
Rta Current A	0.204
Lte Time S	1:23:39
Lte Current A	0.037
Lte Temperature C	290
Lte Deposited Nm	18,64
Preheat Required	no
Preheat Time S	_____
Preheat Max Current A	_____
Preheat Max Pressure Mbar	_____
Sample Location	Gate Valve
File Name	20240424 OVergrowth.txt

Overgrowth Schedule (6 rows):

t	I_SUSI [A]	V_SUSI [V]	T_SUSI [C]	I_samp [A]	V_samp [V]	T_pyro [C]	T_TC [C]	P_MBE [mbar]	Theta [deg]	Shutter	Notes
0917	23.4	6.15	690								
0931	45	4.78	1069								
0936	45	4.73	1060								
0939	45	4.85	1061								
0952	45	4.85	1065								
1106	0	0									

Quality Checks:

Check	Pass	Fail	N/A
Cooling on and pumping	[x]	[ ]	[ ]
Position/angle verified	[x]	[ ]	[ ]
Shutter operations correct	[x]	[ ]	[ ]

Notes / Observations:

Completed by: _____ **Date/Time:** 2025-11-11 14:04

Verified by: _____	**Date/Time:** _____

FINAL REVIEW AND APPROVAL

Review Item	Complete	Initials
All process steps completed as specified	[ ]	_____
All quality checks passed	[ ]	_____
All parameters within specification	[ ]	_____
All deviations documented and approved	[ ]	_____
All required signatures obtained	[ ]	_____
LabVIEW process files linked/attached	[ ]	_____
STM scan files linked/attached	[ ]	_____

Final Approvals:

Quality Control Review:

Signature: _____ Date: _____

Printed Name: _____

Process Engineer Review:

Signature: _____ Date: _____

Printed Name: _____

Principal Investigator Approval:

Signature: _____ Date: _____

Printed Name: _____

This batch manufacturing record must be completed in its entirety and approved by all designated reviewers before the device can proceed to electrical testing or further processing.