

# BATCH MANUFACTURING RECORD

## STM Hydrogen Desorption Lithography Process

<b>Batch Number:</b>	Kingsbury1_20251112_151720	<b>Date Started:</b>	_____
<b>Device ID:</b>	Kingsbury1	<b>Target Completion:</b>	_____
<b>Sample:</b>	_____	<b>Actual Completion:</b>	_____
<b>Primary Operator:</b>	KJS	<b>QC Review:</b>	_____

### Step 1: Ex Situ — New Sample Mounting

<b>Operator Initials:</b> KJS	<b>Start Time:</b> 2025-11-11 12:48	<b>End Time:</b> 2025-11-13 14:16
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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:

<b>Initialed by:</b> KJS	<b>Date/Time:</b> 2025-11-13 14:16
<b>Completed by:</b> KJS	<b>Date/Time:</b> 2025-11-13 14:16

## Step 2: Degassing

<b>Operator Initials:</b> KJS	<b>Start Time:</b> 2025-11-11 12:45	<b>End Time:</b> 2025-11-13 14:16
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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:

<b>Initialed by:</b> KJS	<b>Date/Time:</b> 2025-11-13 14:16
<b>Completed by:</b> KJS	<b>Date/Time:</b> 2025-11-13 14:16

### Step 3: Flashing

<b>Operator Initials:</b> KJS	<b>Start Time:</b> 2025-11-11 12:45	<b>End Time:</b> 2025-11-13 14:16
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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:

<b>Initialed by:</b> KJS	<b>Date/Time:</b> 2025-11-13 14:16
<b>Completed by:</b> KJS	<b>Date/Time:</b> 2025-11-13 14:16

### Step 4: Temperature Calibration (Cooldown analysis)

**Operator Initials:** KJS**Start Time:** 2025-11-11  
12:57**End Time:** 2025-11-13  
14:16

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:****Initiated by:** KJS**Date/Time:** 2025-11-13 14:16**Completed by:** KJS**Date/Time:** 2025-11-13 14:16

## Step 5: Hydrogen Termination

<b>Operator Initials:</b> KJS	<b>Start Time:</b> 2025-11-11 12:45	<b>End Time:</b> 2025-11-13 14:20
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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	0	0	295	49	3.33E-10	Turn to only turbo
1047	0	0	21	0	0	294	49	4.16E-10	Ramp up crakcet at 2A/min.
1055	11.36	10.56	1283	0	0	327	38	7.70E-10	Heat up sample
1056	11.36	10.66	1396	0.063	36.15	304	33	7.89E-10	
1109	11.36	10.76	1538	0.063	26.46	394	97	5.34E-7	Turbo Only. Open H valve f
1119	0	0	420	0	0	294	60	1.67E-9	P_max = 6.4E-7. Cose H2. I

### Quality Checks:

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

### Notes / Observations:

Initiated by: KJS

Date/Time: 2025-11-13 14:20

Completed by: KJS

Date/Time: 2025-11-13 14:20

## Step 6: Termination Check (STM)

**Operator Initials:** KJS**Start Time:** 2025-11-11  
12:45**End Time:** 2025-11-13  
14:20

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:****Initialed by:** KJS**Date/Time:** 2025-11-13 14:20**Completed by:** KJS**Date/Time:** 2025-11-13 14:20

## Step 7: STM HDL

<b>Operator Initials:</b> KJS	<b>Start Time:</b> 2025-11-11 13:14	<b>End Time:</b> 2025-11-13 14:20
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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:

<b>Initialed by:</b> KJS	<b>Date/Time:</b> 2025-11-13 14:20
<b>Completed by:</b> KJS	<b>Date/Time:</b> 2025-11-13 14:20

## Step 8: Dose (XH3)

<b>Operator Initials:</b> KJS	<b>Start Time:</b> 2025-11-11 12:45	<b>End Time:</b> 2025-11-13 14:20
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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:**

Initialed by: KJS	Date/Time: 2025-11-13 14:20
Completed by: KJS	Date/Time: 2025-11-13 14:20

## Step 9: Incorporation

<b>Operator Initials:</b> KJS	<b>Start Time:</b> 2025-11-11 12:45	<b>End Time:</b> 2025-11-13 14:20
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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:

Initialed by: KJS

Date/Time: 2025-11-13 14:20

Completed by: KJS

Date/Time: 2025-11-13 14:20

## Step 10: Overgrowth (LL + RTA + LTE)

<b>Operator Initials:</b> KJS	<b>Start Time:</b> 2025-11-11 12:45	<b>End Time:</b> 2025-11-13 14:24
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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	
LI Time S	6:06	
LI Current A	0	
LI 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	<hr/>	
Preheat Max Current A	<hr/>	
Preheat Max Pressure Mbar	<hr/>	
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 [CP]	_MBE [mbat]	theta [deg]	Shutter	Notes
0917	23.4	6.15	690	0	0	<300	18	6.1E-10	X	closed	Move sample into position
0931	45	4.78	1069	0	0	419	43	1.75E-9	135	open	Start QCM. Start LL
0936	45	4.73	1060	0	0	401	81	1.57E-9	45	closed	Stop LL
0939	45	4.85	1061	0.204		354	93	1.71E-9	45	closed	15 sec RTA
0952	45	4.85	1065	0.037	34.23	402	83	1.52E-9	135	open	Start LTE
1106	0	0							45	closed	Stop LTE

### Quality Checks:

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

### Notes / Observations:

Initiated by: KJS

Date/Time: 2025-11-13 14:24

**Completed by:** KJS

**Date/Time:** 2025-11-13 14:24

## FINAL REVIEW AND APPROVAL

<b>&lt;b&gt;Review Item&lt;/b&gt;</b>	<b>&lt;b&gt;Complete&lt;/b&gt;</b>	<b>&lt;b&gt;Initials&lt;/b&gt;</b>
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.*